

L E T T E R S

C O N C E R N I N G T H E

N O R T H E R N C O A S T


O F T H E

C O U N T Y O F A N T R I M ,

I N

I R E L A N D.





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Scale of one Inch to a Mile

← Setting of the first of Flood Tide

☼ Places containing Columnar Basaltes

Times of high water marked in Roman numerals

MAP
of the
Northern Coast
of ANTRIM
in
IRELAND.



L E T T E R S

CONCERNING THE
NORTHERN COAST
OF THE
COUNTY OF ANTRIM.

CONTAINING
A NATURAL HISTORY
OF ITS BASALTES:

WITH AN
A C C O U N T
OF SUCH
C I R C U M S T A N C E S
AS ARE WORTHY OF NOTICE RESPECTING THE
ANTIQUITIES, MANNERS AND CUSTOMS
OF THAT COUNTRY.

THE WHOLE ILLUSTRATED BY AN
A C C U R A T E M A P
OF THE
COAST, ROADS, MOUNTAINS, &c.

In these LETTERS is stated a plain and impartial VIEW of the
VOLCANIC THEORY of the BASALTES.

BY THE REV. WILLIAM HAMILTON, A. M.
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THE UNIVERSITY OF CHICAGO

PHILOSOPHY DEPARTMENT

PHILOSOPHY 101

LECTURE 1

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L E T T E R S

[1]

L E T T E R S

C O N C E R N I N G T H E

N O R T H E R N C O A S T

O F T H E

C O U N T Y O F A N T R I M , I N I R E L A N D .

L E T T E R I .

Portrush, July 20, 1784.

DEAR SIR,

MY natural curiosity, and the wish I had to trace the whole extent of the Basaltes of this country, induced me to make a short voyage, some days ago, to the island of Raghery, which lies six or seven miles off the north coast of Antrim, opposite to Ballycastle bay.

B

I ENJOYED

2 LETTERS CONCERNING THE

I ENJOYED a good deal of pleasure in examining that little spot, which to me was almost a new kingdom; and if an account of it can at all contribute to amuse an idle hour of your's, I shall more than double my own gratification.

THOUGH the island be not very remote, yet its situation, so much exposed to the northern ocean, and the turbulence of its irregular tides, have thrown such difficulties in the way of landsmen, that few have visited it but from necessity; and some curious arrangements of the columnar Basaltes, with which it abounds, have never been noticed except by the inhabitants.

THE chalky cliffs of Raghery, crowned by a venerable covering of brown rock, form a very beautiful and picturesque appearance as one sails toward them; and if the turbulence of the sea do not restrain the eyes and fancy from expatiating around, such a striking similitude appears between this and the opposite coast, as readily suggests an idea
that

that the island might once have formed a part of the adjoining country, from whence it has been disunited by some violent shock of nature.

YOU, to whom demonstration is familiar, will naturally wonder to see two shores, seven or eight miles asunder, so expeditiously connected by such a slender and fanciful middle term as apparent similitude; and yet the likeness is so strong, and attended with such peculiar circumstances, that I do not entirely despair of prevailing even on you to acknowledge my opinion as a probable one.

IT does not appear unreasonable to conclude, that, if two pieces of land, separated from each other by a chasm, be composed of the same kind of materials, similarly arranged, at equal elevations, these different lands might have been originally connected, and the chasm be only accidental.—For let us conceive the materials to be deposited by any of the elements of fire, air, earth or water, or by any cause whatever, and it is not likely

that this cause, otherwise general, should in all its operations regularly stop short at the chasm.

THE materials of which the island of Rathery is composed, are accurately the same as those of the opposite shore, and the arrangement answers so closely, as almost to demonstrate at first view their former union. But to explain this more clearly, it will be necessary to give you a general sketch of this whole line of coast.

THE northern coast of Antrim seems to have been originally a compact body of limestone rock, considerably higher than the present level of the sea; over which, at some later period, extensive bodies of vitrifiable stone have been superinduced in a state of softness. The original calcareous stratum appears to be very much deranged and interrupted by these incumbent masses. In some places it is depressed greatly below its ancient level—Shortly after it is borne down to the water's edge, and can be traced under
its

its surface—By and by it dips entirely, and seems irretrievably lost under the superior mafs—In a fhort fpace, however, it begins to emerge, and after a fimilar variation recovers its original height.

IN this manner, and with fuch repeated viciffitudes of elevation and depreffion, it purfues a courfe of forty miles along the coaft, from Lough Foyle to Lough Larne.

IT naturally becomes an object of curiofity to enquire what the fubftance is from which the limestone feems thus to have fhunk, burying itfelf (as it were in terror) under the covering of the ocean. And on examination it appears to be the columnar Bafaltes, under which the limestone ftratum is never found, nor indeed does it ever approach near to it without evident figns of derangement.

THUS for example :—The chalky cliffs may be difcovered a little eaftward from Portrufh; after a fhort courfe, they are fuddenly depreffed

pressed to the water's edge under Dunluce Castle, and soon after lost entirely in passing near the basalt hill of Dunluce, whose craigs near the sea are all columnar. At the river Bush the limestone recovers, and skims for a moment along the level of the sea, but immediately vanishes on approaching toward the great basalt promontory of Bengore, under which it is completely lost for the space of more than three miles.

EASTWARD from thence, beyond Dunfeverick Castle, it again emerges, and rising to a considerable height, forms a beautiful barrier to White Park bay and the Ballintoy shore. After this it suffers a temporary depression near the basalt hill of Knockfoghy, and then ranges along the coast as far as Ballycastle bay.

FAIRHEAD, standing with magnificence on its massy columns of basaltes, again exterminates it; and once again it rises to the Eastward, and pursues its devious course, forming, on the Glenarm shores, a line of coast
the

the most fantastically beautiful that can be imagined.

IF this tedious expedition have not entirely worn out your patience, let us now take a view of the coast of Rathfriland itself, from the lofty summit of Fairhead which overlooks it. Westward, we see its white cliffs rising abruptly from the ocean, corresponding accurately in materials and elevation with those of the opposite shore, and like them crowned with a venerable load of the same vitrifiable rock. Eastward, we behold it dip to the level of the sea, and soon give place to many beautiful arrangements of basalt pillars which form the eastern end of the island, and lie opposite to the basaltes of Fairhead, affording in every part a reasonable presumption that the two coasts were formerly connected, and that each was created and deranged by the same causes extensively operating over both.

BUT it is not in these larger features alone, that the similitude may be traced; the more
minute

minute and accidental circumstances serve equally well to ascertain it.

THUS, an heterogeneous mass of freestone, coals, iron ore, &c. which forms the east side of Ballycastle bay, and appears quite different from the common fossils of the country, may be traced also directly opposite, running under Raghery, with circumstances which almost demonstrably ascertain it to be the same vein.

WHAT I would infer from hence is, that this whole coast has undergone considerable changes, in the course of successive ages ;—that those abrupt promontories, which now run wildly into the ocean, in proud defiance of its boisterous waves, have been rendered broken and irregular by some violent convulsion of nature ;—and that the island of Raghery, standing as it were in the midst between this and the Scottish coast, may be the surviving fragment of a large tract of country which, at some period of time, has been buried in the deep.

BUT

BUT I shall wave this tedious subject for the present, and endeavour to compensate for the dryness of this letter by some account of the state and singularities of this little island.

IN the mean time, I must entreat you will be so candid as to give me timely notice whenever my letters become dull and unentertaining—I shall otherwise lose my labour to very bad purpose, as the chief object of them is to amuse you.

I am, dear Sir, with the greatest respect,

Your affectionate, &c.

LETTER

L E T T E R II.

Portrush, July 27, 1784.

DEAR SIR,

THE remarkable haziness which has prevailed in our atmosphere, during the whole of this summer, both by sea and land, has been very unfavourable to views along the coast, and even in the short trip I made to Raghery, gave me reason to be apprehensive of missing our course, as the rapidity of the tides soon carries a vessel clear of the island. However, with the assistance of a gleam from the meridian sun, we got safely across the channel, in the space of two or three hours.

RAGHERY

RAGHERY is near five miles in length, and about three quarters of a mile in breadth; toward the middle it is bent in an angle opposite to Ballycastle, and forms a tolerable bay, affording good anchorage, in deep water, with a stiff clay bottom; but a westerly wind raises such a heavy swell all along this coast, that few vessels can ride out a gale from that quarter.

Its tides are very remarkable.—Here it is that the great body of water which flows from the ocean during the flood tide, to supply the north part of the Irish channel, is first confined and broken in its course; and a large portion of it is returned near the west end of the island, in a counter tide, which supplies all the loughs and bays for the space of thirty miles, running toward the west, along the counties of Antrim, Derry and Donegal; while in the mean time, the true tide of flood runs toward the east, at the distance of a few miles from the coast, parallel to the former.

FROM

FROM such eddys as this many singular irregularities arise, and in several places the tide from the westward, (or the flood tide, as they denominate it) appears to flow nine hours, while the ebb continues only three.

SEAMEN who are accustomed to navigate along this coast, know well how to use these different streams to good purpose. For example:—A ship leaving Dublin with the flood tide (which comes into the Irish channel from the southward) may with a leading wind reach the county of Down; there the vessel will fall in with the northern tide of ebb, just then beginning to return to the ocean. With the assistance of this current, and the same leading breeze, the ship may fetch the isle of Raghery; where a judicious pilot, instead of opposing the returning tide of flood, may drop into the northern eddy, which will carry him as far as Lough Swilly; where the true tide of ebb will again receive him, and bear his ship out to the western ocean.

THUS

THUS by prudent management may he enjoy the advantage of four different successive tides, all favourable to his voyage.

THE western winds (which prevail here during far the greater part of the year) sweeping with an uninterrupted blast over the Atlantic Ocean, roll a most formidable wave along this coast, of which I had some experience in crossing to the island.—The day was uncommonly still, not a breath of wind to ruffle the water, and yet a heavy majestic swell, ever heaving forward, seemed to threaten ruin to our boat, and frequently hid from view even the lofty promontory of Fairhead. From this unruffled surface however there was not the slightest danger to be apprehended, and our vessel rose and descended on the glassy wave with entire security. How changed was this scene in the course of a few hours!—The moment that the ebb began to return to the ocean, rushing in opposition to this western swell, all was confusion and tumult. The long wave which but just before rolled forward in silent majesty, was now fretted
and

and broken into a tempestuous sea, which the stoutest boats dare not encounter, and even the best ships wish to avoid.

THIS alternate scene of peace and war takes place twice every day, and it is by attention to this circumstance that the passage is made with tolerable security.

THE little skiff in which I navigated was built of very slight materials, and did not seem to me well calculated to buffet these stormy seas. I observed that we had received a good deal of water into it; and on expressing my uneasiness that there was no visible means of throwing it out, one of the boatmen instantly took off his brogue, with which he soon cleared the vessel of water, and put it on his foot again without seeming to feel the slightest inconvenience from the wetness of it, leaving me quite at ease on the subject of pumping the vessel.

RAGHERY contains about twelve hundred inhabitants, and is rather over-peopled, as
there

there is no considerable manufacture which might give employment to any superfluous hands *.

THE cultivated land is kindly enough, and produces excellent barley. In a plentiful year six hundred pounds worth of this grain has been exported from it. The craigy pasturage fattens a small, but delicious breed of sheep. Even its inhospitable rocks supply to the hand of industry a rich source of wealth in the sea weed it affords for the manufacture of kelp, which under an indulgent landlord

* From a census since held by the priest of the island, in order to lay a tax of one shilling on each person above the age of sixteen years, for the purpose of erecting a mass house, it appears that the numbers amount to eleven hundred; there are one hundred and forty families, which almost average at the rate of eight persons to each family. The census has produced a great deal of uneasiness in the island from an opinion that one person will die during the year in each family so numbered.

often

often goes near to pay the whole rent of the island*.

THE horses, as well as the sheep, are small in kind, but extremely serviceable, and

* This year an hundred tuns of kelp have been exported from Raghery, which was bought by the linen bleachers of the North of Ireland at 5l. 5s. per tun, the whole amounting to more than 525l. The annual rent of the island is but 600l. This entire manufacture is carried on by women and children, while the men are employed in more hazardous services. At low water the sea weed is cut from the rocks, and spread out before the sun to dry; at night it is made up in little parcels, which are opened and shaken out again whenever the weather permits; this process is continued till the weed becomes dry enough to be burnt. A hole is then made in the ground, and a little temporary kiln erected, of loose stones, in which the weed is cautiously and gradually burned. During this process the vegetable salt and every thing not capable of being easily dissipated by the fire, melts, and coalesces in one mass at the bottom of the kiln. In this state it is exported, no means having been yet established here, or in any part of the adjoining coast, to purify the alkaline salt from the various mixtures of marine salt, &c. with which it abounds.

sure-footed beyond conception. Of this I had a strong proof in a little expedition which I made through the island in company with Mr. Gage, the hospitable proprietor of it. You must know it was but the other day the people of Raghery recollected that a road might be some convenience to them, so that in our excursion we were obliged to follow the old custom of riding over precipices, which would not appear contemptible, even to a man who enjoyed the full use of his legs.

It seems my horse, though fifteen or sixteen years old, had never before felt a bridle in his mouth, and after many attempts to shake it off, in a very critical situation, on the top of a rugged precipice, he refused to proceed one step further, while this troublesome incumbrance impeded him. Having no other resource I was obliged to comply, and was carried over an exceeding dangerous heap of rocks, with a degree of caution which amazed me in the midst of my terrors.

IT is somewhat singular that this island should not contain any native quadruped, except those universal travellers the rats*, and the little shrew mouse, which is sometimes found. But the various tribes of foxes, hares, rabbits, badgers, &c. for which it might afford excellent shelter, and which abound on the opposite shore, are here unknown. A few brace of hares indeed were lately introduced by the proprietor, which bid fair to produce a large encrease.

A GOOD many years ago Lord Antrim gave orders to his huntsman to transport a couple of foxes into the island, for the purpose of propagating that precious breed of animals. But the inhabitants assembled in

* I had some hope that the native black rat of this kingdom might have secured a retreat in this sequestered island, but in vain, their powerful northern enemies, with the cruelty of the old Danes, but with more success, have utterly exterminated the natives, and the rat of Norway has completely extended his wasteful dominion over Raghery.

consternation, and having subscribed each a hank of yarn, prevailed on the huntsman to disobey orders. However he was sharp enough to take the hint, and for some years paid his annual visit to Raghery, for the purpose of raising a regular tribute, to save the poor islanders from those desolating invaders.

THE inhabitants are a simple, laborious, and honest race of people, and possess a degree of affection for their island which may very much surprize a stranger. In conversation they always talk of Ireland as a foreign kingdom, and really have scarce any intercourse with it except in the way of their little trade.—A common and heavy curse among them is—“May Ireland be your hinder
“end.”

FROM this amor patriæ arises their great population, notwithstanding the perils which attend their turbulent coast, as they never entertain a thought of trying to better their fortune by settling in any of the neighbouring towns of Antrim.

THE

THE tedious processes of civil law are little known in Raghery ; and indeed the affection which they bear to their landlord, whom they always speak of by the endearing name of master, together with their own simplicity of manners, renders the interference of the civil magistrate very unnecessary. The seizure of a cow or a horse, for a few days, to bring the defaulter to a sense of duty ; or a copious draught of salt water from the surrounding ocean, in criminal cases, forms the greater part of the sanctions and punishments of the island. If the offender be wicked beyond hope, banishment to Ireland is the dernier resort, and soon frees the community from this pestilential member.

IN a sequestered island like this, one would expect to find bigoted superstition flourish successfully under the auspices of the Romish church ; but the simplicity of the islanders does not foster any uncharitable tenets, and contrary to one's expectation, they are neither grossly superstitious, nor rank bigots, but have been known to hold the unchristian

tian doctrines of their late Spanish priest in great contempt—nay in cases of necessity they do not scruple to apply for assistance to the Protestant minister. Of their good will to the established church they give an annual proof which one rarely finds in any other part of Ireland. The minister's tythe amounts to about 100*l.* per annum, and when the islanders have got in their own harvest, they give the parson a day of their horses and cars, and bring the entire tythe home to his farm-yard.

THE chief desideratum of the islanders is a physician, the want of whom they seem to consider as their greatest misfortune, though their master appears to be of a very different sentiment; and indeed the remarkable population of Raghery makes much in favour of his opinion.

SMALL as this spot is one can nevertheless trace two different characters among its inhabitants. The Kenramer or western end, is craigy and mountainous, the land in
the

the vallies is rich and well cultivated, but the coast destitute of harbours. A single native is here known to fix his rope to a stake driven into the summit of a precipice, and from thence, alone, and unassisted, to swing down the face of a rock in quest of the nests of sea fowl. From hence activity, bodily strength, and self-dependance, are eminent among the Kenramer men. Want of intercourse with strangers has preserved many peculiarities, and their native Irish continues to be the universal language.

THE Ushet end, on the contrary, is barren in its soil, but more open and well supplied with little harbours; hence its inhabitants are become fishermen, are accustomed to make short voyages, and to barter. Intercourse with strangers has rubbed off many of their peculiarities, and the English language is well understood and generally spoken among them.

THIS distinction I fear may seem foolishly speculative, considering the diminutive object
of

of it, and yet I assure you it is a matter of fact ; and the inhabitants themselves are so well aware of it, that in perilous situations different offices and stations are appointed to each, according as he is an Ushet or Kenramer man.

RAGHERY has formerly been as it were a stepping stone between the Irish and Scottish coasts, which the natives of each country alternately used in their various expeditions, and for which they frequently fought.

A NUMBER of small Tumuli were lately opened in a little plain about the middle of the island, probably the monuments of so many heroes who in former ages had fallen honourably in this very field of battle. The chief himself lay in a stone coffin, and beside him an earthen vessel stood, which, by the residuum still visible, seemed formerly to have contained an offering of blood, or some perishable animal substance. Within the Tumuli lay a considerable number of human bones, the remains of more ignoble men,
who

who might have fallen by the like fate of war.

BRAZEN swords, and spear heads of the same metal, found in this plain, bear strong evidence of the bloody scenes which have been transacted here in remote ages. A large silver Fibula was found in one of the Tumuli, which is deposited in the museum of Trinity College, Dublin; the workmanship is good, and argues considerable skill in the artist.

THE traditions of the country do not go beyond the obscure period of Scottish and Danish incursions, which have alternately ravaged and depopulated the island. The memory of a cruel massacre, perpetrated by a Scottish clan (I think the Campbells) remains so strongly impressed on the minds of the present inhabitants, that no person of that name is allowed to settle in the island.

DURING the disturbances in Scotland, which succeeded the appointment of Baliol to the crown

crown of that kingdom, Robert Bruce was driven out, and obliged to take shelter with a friend of his in the isle of Raghery*. However his enemies pursued him even to this remote spot, and forced him to embark in a little skiff, and seek refuge on the ocean. The remains of a fortress are yet visible on the northern angle of the island, celebrated for the defence which this hero made in it, and still known by the name of Robert Bruce's castle. The antiquity of this building is therefore not much less than five hundred years; it may indeed be considerably older, as the time which Bruce spent in Raghery was scarce sufficient for the purpose of erecting it.

ONE thing concerning this castle is worth remarking, that the lime of which it is

* Rex ipse cum uno plerumque comite, interim solus, per loca maxime inculta pererrabat, et cum ne sic quidem sibi tutus a civium perfidiâ et hostium crudelitate videretur, in Æbudas, ad veterem quendam amicum transmisit. It is probable this was the time when Bruce came to Raghery.—*Buchannon's Hist. Scot.*

built has been burned with sea coal, the cinders of which are still visible in it, and bear so strong a resemblance to the cinder of the Ballycastle coal as makes it extremely probable that our information concerning the collieries of that place is far from being an original discovery. Indeed there is reason to believe that they were both well known, and extensively wrought, at a period of time when few people imagine either the civilization or finances of this kingdom were equal to so expensive an undertaking *.

* It may perhaps be imagined that the coals might have been brought from Britain; but a little reflection will shew that to be extremely improbable, even so late as the time of Robert Bruce. It was but just then that the English themselves had discovered the use of sea coal, as a fuel; and we find in the time of Edward the First, that after being tried in London, they were immediately prohibited, on a hasty opinion that the vapour was noxious to the health of the inhabitants. It is not therefore to be readily believed that at this early period England could have had any extensive export trade in coals: Or, if so, it must have been to some populous and civilized country, to some safe harbour, to a great and commercial town; but, at the time we speak of, the British charts do not lay down a single village in all this line of coast.

BUT

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BUT this is a curious subject, and I shall take some other opportunity of giving you more information when you may not be fatigued with so large and I fear so tedious a letter.

L E T T E R

L E T T E R III.

Portrush, July 30, 1784.

DEAR SIR,

IN my return from Raghery I spent a few days at Ballycastle, a town pretty considerable in this part of the world, which has been almost entirely the creation of one man, a Mr. Boyd, who died some years ago.

ACCORDING to the Persian system of moral duties*, it is likely Ireland cannot boast of an individual who has more fully dis-

* Faire un Enfant, Planter un Arbre, & Labourer un Champ.—*Vide Montesquieu's Persian Letters.*

charged his trust than old Mr. Boyd ; not possessed of any considerable fortune, not supported by powerful natural connexions, nor endowed with any very superior talents, this man opened public roads, formed a harbour, built a town, established manufactures, and lived to see a wild and lawless country become populous, cultivated and civilized.—In the most literal sense his soul seems to have animated this little colony ; in him it enjoyed life and strength, and with him all vigour and animation perished.—By an ill-judged distribution of his fortune, and various untoward and unforeseen accidents, the manufactures of glass were neglected, the breweries and tanneries were mismanaged, the harbour became choaked up with sand, and even the collieries (from particular circumstances) are not wrought with such spirit as the present proprietor would wish to exert.—In short this gentleman constructed a most excellent machine, but unfortunately left it without any permanent principle of motion.

THE eastern side of Ballycastle bay terminates in the bold promontory of Fairhead.—Between this and the town lie the collieries, in an abrupt bank which overhangs the sea: Ships however cannot derive much advantage from this circumstance, as the unprotected situation of the place, and the prevailing western winds, makes a delay on the coast extremely dangerous, and renders it difficult to embark the coals.

THE different fossils which generally lie above the coal, are till or slate-coal, iron ore, and freestone*.

It

* I was very much pleased with the discovery of a natural process among these fossils, not very unlike our artificial one for making crystals of martial vitriol. You know that martial or green vitriol is a salt formed from the calx of iron united to the vitriolic acid, and that the component parts of sulphur are phlogiston, or the principle of inflammability, united to the vitriolic acid.—It so happens that a thin layer of iron ore lies immediately over a bed of coal; in the places where this is exposed to the air and weather, the sulphur of the coal becomes decomposed,

It unfortunately happens that these beds (like most of the fossils of this kingdom which are formed in layers) dip, or underlie, to the southward; hence it follows, that when an horizontal adit, or level, has been pushed forward to the bed of coal, from the steep bank which faces toward the north, the men, in following the mine, are obliged to work downward, and have no means of carrying off the water—whereas if the dip of the beds were in a contrary direction (that is, toward the north) the work must be all up hill; by which the loaded waggons would have an easy descent outward, and all the water must constantly flow off toward the sea.

In my last letter I mentioned some reasons which might induce one to think that these collieries were wrought at a very re-

posed, losing its phlogiston, while its other principle, namely the vitriolic acid, uniting with the calx of the iron, forms chrystals of green vitriol, which lie in considerable quantity between the two layers.

mote period of time; but an accidental discovery has lately put that matter beyond doubt, and has laid open a very curious circumstance in the ancient history of this country.

ABOUT twelve years ago, the workmen, in pushing forward a new adit toward the coal, unexpectedly broke through the rock* into a cavern. The hole which they opened was not very large, and two young lads were made to creep in, with candles, to explore this new region. They accordingly went forward, and entered an extensive labyrinth branching off into numerous apartments, in the mazes and windings of which they were at last completely lost.—After various vain attempts to return, their lights were extin-

* The adit is carried along the side of a course of hard rock, which cuts all the layers of coal, running north and south in a direction perpendicular to the horizon.—It is called here a Gaur or March, and I apprehend is the same as what the Cornish miners call a Crose Goffan.

guished, and they sat down together in utter despair of an escape from this dreary dungeon.—In the mean time, the people without in the drift were alarmed for their safety, fresh hands were employed, a passage was at last made for the workmen, and the two unfortunate adventurers, extricated after a whole night's imprisonment.

ON examining this subterranean wonder, it was found to be a complete gallery which had been driven forward many hundred yards to the bed of coal ;—that it branched off into various chambers, where the miners had pushed on their different works ;—that pillars were left, at proper intervals, to support the roof ;—in short, it was found to be an extensive mine, wrought by a set of people, at least as expert in the business as the present generation. Some remains of the tools, and even the baskets used in the works, were discovered, but in such a state that on being touched they immediately fell to powder.

THE antiquity of this work is pretty evident from hence, that there does not remain the most remote tradition of it in the country ; but it is still more strongly demonstrable from a natural process which has taken place since its formation, for stalactite pillars had been generated, reaching from the roof of the pit to the floor ; and the sides and supports were found covered with sparry incrustations, which the present workmen do not observe to be deposited in any definite portion of time.

THE people of this place attribute these works to the Danes ; but a very slight consideration of the matter must satisfy any one that this opinion is ill-founded.—The Danes were never peaceable possessors of Ireland, but always engaged in bloody wars with the natives, in which they were alternately victors and vanquished.—Like the eastern descendants of Ishmael they stood at perpetual bay with all the world, their hand against every man, and every man's hand against them.

It is not surely to the tumultuary and barbarous armies of the ninth and tenth centuries, whose harvest of wealth and power could only be expected from the rapid and hazardous ravages of war, that we are to attribute the slow and toilsome operations of peace which are carried on only where population, civilization, and trade flourish in an extreme degree.

WHILE Ireland lay yet prostrate, and gasping under the fatal wounds received in a bloody struggle of two hundred years, against these northern invaders, the English, under Henry the Second, made their successful inroad, and easily established themselves in a feeble and distracted country; from which time, till the beginning of the present century, this island presents nothing to our view but a wasteful scene of misery and desolation. That these collieries could have been wrought during this period seems extremely improbable.—We are all along execrated by the English writers as a nation of barbarians, and our country cursed as a wilderness of

of forests and bogs.—It is not then to be supposed that a savage people should ransack the bowels of the earth for coal, while their woods and bogs afforded such abundant fuel to their hand.

UPON the whole, during the dreary interval of near a thousand years, from the eighth to the eighteenth century, it is in vain to look for the laboured works of industry and peace, in a kingdom where war was the only trade, and where all property turned on the edge of the sword.

THE discovery of this colliery is one of those proofs, which (without directly deciding either time or persons) tend strongly to shew that there was an age when Ireland enjoyed a considerable share of civilization.—Yet, most of the English writers, conceiving this desolate and distracted kingdom to have been naturally such as they found it, eagerly pronounced it (with all the intemperate bitterness of enemies) to be a nation without laws, without monuments, without records, without
any

any traces whatever of former civilization : but many things which have still escaped the wreck of time, and the fury of invaders, concur to demonstrate this to be a hasty assertion.

THE round towers * of Ireland alone, are sufficient to shew that we had public monuments before the arrival of the English †, which were original in their kind, and not inelegant in their structure.—The remains of our ancient religious buildings which may be seen in the valley of Glendalough, at Clonmacnois ‡, and many other parts of the island, exhibit a species of architecture by no means deformed, and yet differing exceedingly both from the Grecian style of building, and from the Gothic orders which were adopted in Britain.—The few scattered frag-

* Of these there are upwards of fifty still remaining.

† Turres ecclesiasticas quæ more patrio arctæ sunt et altæ, nec non et rotundæ.—*Vide Giraldus Cambrensis.*

‡ Built anno dom. 547.—*Vide Sir James Ware.*

ments of our Brehon laws, which have been recovered by our ingenious English champion, Colonel Vallancey, among many curious particulars respecting the preservation of private property, inflict severe penalties on the person who shall injure his neighbour's trees, every sort of which is enumerated, and even the shrubs and underwood are guarded by sanctions.—It appears from hence, that there was a time when this island was not a kingdom over-run with forests and bogs; when fuel was actually scarce, and laws made to defend it, as the property of individuals*.

THE

* It may not appear unreasonable to date the working of the Ballycastle collieries at such a remote period as this, when from these laws of the Brehons we may naturally infer that wood was by no means a redundant article in Ireland. Though turf has been our common fuel for several years past, yet are there many circumstances which must lead one to imagine that this substance has been entirely generated within these last thousand years, while tillage and all attention to agriculture gave place to war and rapine alone. This will not appear surprising to any person who considers that turf bog encreases by a process much resembling vegetation, and that the best land, if neglected,
may

THE numerous instruments of peace and war, the many curious and costly ornaments of drefs*, which are every day dug out of

may by various accidents be very soon reduced to a state of rank bog. It is indeed next to demonstration that many of the places where turf is cut at present have been once arable land, vestiges of which are discoverable at great depths, and wooden paleings traced many feet under the surface—even at this day marks of the plough appear on the summit of several mountains in the North of Ireland, where the great population of that country (which is at present better inhabited than most parts of Europe) has not yet spread itself. The following instance will shew how extensive may be the encrease of bog in a desolate country, even in so short a period as two hundred years :

“ When O'Donnell and Tyrone came to the relief of
 “ Kinsale, they wasted the country as they came through
 “ Connaught, which by means of the Earl of Clanrickard
 “ was generally loyal ; and there is a great tract of ground
 “ now a bog which was then plowed land, and there stands
 “ the house of my Lord in the midst of it. If, there-
 “ fore, want of industry has in our remembrance made
 “ one bog, no wonder if a country famous for laziness,
 “ as Ireland now is, abound with them.”—*Vide Letter from Mr. William King to the Dublin Society.*

* Vide Museum of Trin. Coll. Dub. Vide Colonel Vallancey's Collectanea de reb. Hib.

our fields, afford abundant proofs that the arts once flourished in Ireland, and that the precious metals were not unknown here. Of the latter, many are exquisitely wrought, many of such intrinsic value as to prove that gold and silver once abounded in Ireland in prodigious quantity * ; that there was a time when we had more than the bare necessities of life, and when poverty did not compel us to pay our taxes in cattle.

THE greater part of these are originals in their kind, unlike any thing known at present, and of such decided antiquity, that even their uses and purposes can rarely be inferred by any analogy derived from things in use at this day ; tending in the clearest manner to demonstrate that the ancient arts and fashions of this island have certainly not been borrowed from our British neighbours, at any time posterior to the Norman conquest.

* Within the limits of my own knowledge golden ornaments have been found to the amount of near one thousand pounds in value.

BUT

BUT it is not in architecture or mere mechanical works alone, that the early Irish seem to have made a tolerable proficiency.—Whoever will take the trouble to consult ancient authors that have treated of this country, may perhaps be satisfied, that it has been many ages since, the seat of learning and of piety.

THE venerable Bede lived eleven hundred years ago*, and he speaks of it as a rich and happy kingdom, undisturbed by those bloody wars which harraſſed the reſt of the world during the barbarous ages † ;—as a land to which the nobility and gentry of Britain reſorted for their education ;—as a nation which gratuitouſly afforded maintenance, books and maſters to all ſtrangers, who came thither for the ſake of learning ‡.

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* Bede was born A. D. 678.

† *Insulæ hujus ſitus eſt amænus, ac adverſantium exterrarum carens bello nationum.*—*Bede Vita S. Columbi. Cap. 1.*

‡ *Erant ibidem (in Hiberniâ) multi Nobilium ſimul et Mediocrum de gente Anglorum, qui relictâ inſulâ patriâ, vel*

It may perhaps be objected that the learning of these days was nothing but the musty knowledge of a monastery, and its boasted piety little else than the rank superstition of the church of Rome. Much however may be said to invalidate this opinion. The excellent and learned Archbishop Usher has clearly demonstrated that the supremacy of Rome was unknown to the ancient Irish; that the worship of saints and images was held in abhorrence, and no ceremonies used which

vel Divinæ Lectionis, seu continentioris vitæ gratiâ eo secesserunt.—Quos omnes Scoti, libentissime suscipientes, victum iis quotidianum sine precio, libros quoque ad legendum, et magisterium gratuitum præberi curabant.—*Bede Hist. Gent. Angl. Lib. 3. C. 27.*

The Saxons flocked to Ireland as to a great mart for learning—hence we find this expression so often among our writers—“such a person was sent over to Ireland to be “educated.”—Nor is there any reason to wonder that Ireland, now rude and barbarous, should once have been so full of learning and piety, when the rest of the world was involved in barbarism—for so the wisdom of Providence ordereth it, that a shoot of knowledge may still remain for the good of mankind.—*Vide Camden's Britannia.*

were

were not strictly warranted by scripture ; that all descriptions of people were allowed, and desired to consult the sacred writers as their only rule of conduct ; and from the passages quoted by their teachers, it appears that they read the *original*, as their proper authority, and often corrected the Latin text*. —In short, from the evidence produced by this learned and faithful writer, we have the strongest reason to conclude that this island enjoyed the blessings of a pure and enlightened piety, such as our Saviour himself taught, unembarrassed by any of the idle tenets of the Romish church ; and that it is to the English invaders of the twelfth century we are chiefly indebted for the establishment of a religion which has deluged the kingdom with blood, and been the great source of almost all its calamities.

I FEAR you may be ready to start at this, as a paradox too wild and too novel to gain

* Vide a curious treatise of Archbishop Usher on the religion of the ancient Irish.

credit.—Accuse the protestant kingdom of England of introducing popery, with all its attendant train of miseries, into Ireland ; and applaud the Irish as the genuine votaries of the reformed religion?—Yet methinks when we cast our eyes on King Henry the Second, advancing toward this devoted nation, bearing in one hand the bloody sword of war, and in the other the iniquitous bull of Pope Adrian, granting him unlimited authority to root out heresy, and to extend the empire of Rome *—we see an irrefragable argument to prove that this was not originally an island of popish saints, and that the jurisdiction of Rome was not unquestionably established here ; since it does by no means accord with the principles of that court, to sacrifice its obsequious votaries to the ambition of a proud prince, who seemed but ill suited to accommodate himself implicitly to the papal authority.

* To Ireland also by King Henry (Le Fitz Of Maude, daughter of first King Henry)
That conquered it for their great heresy.

Vide Harding's Chron. C. 241.

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IN fine, many and unequivocal circumstances concur, to prove, that during the barbarous ages, when the rest of Europe was involved in all the horrors of bloodshed, ignorance and superstition, this sequestered island enjoyed the blessings of peace, of learning, and of a pure religion, and was literally the happy country described in the following lines by St. Donatus, bishop of Etruria, who died in the year 840.

“ Far westward lies an isle of ancient fame,
 “ By nature blest’d, and Scotia* is her name;
 “ An island rich—exhaustless is her store
 “ Of veiny silver and of golden ore;
 “ Her fruitful soil for ever teems with wealth,
 “ With gems† her waters, and her air with
 “ health.

* The ancient name of Ireland.—*Vide Bede and others in many places.*

† Pearls are still found in many rivers of Ireland, some of them very valuable.—*Vide Museum of Trin. Coll. Dub.*
 —*Vide an Account of the Pearl Fishery of Ireland by Sir Robert Reding.*

“ Her

“ Her verdant fields with milk and honey flow,
 “ Her woolly fleeces vie with virgin snow ;
 “ Her waving furrows float with bearded corn,
 “ And arms and arts her envy'd sons adorn.

“ No savage bear with lawless fury roves,
 “ No rav'ning lion thro' her sacred groves,
 “ No poison there infects, no scaly snake
 “ Creeps thro' the grass, nor frog annoys the
 “ lake.

“ An island worthy of its pious race,
 “ In war triumphant, and unmatched in peace*.”

I remain your's.

* Finibus occiduis describitur optima tellus,
 Nomine, et antiquis Scotia scripta libris.
 Infula dives opum, gemmarum, vestis, et auri ;
 Commoda corporibus aere, sole, solo.
 Melle fluit, pulchris et lacteis Scotia campis,
 Vestibus atque armis, frugibus, arte, viris.
 Urforum rabieis nulla est ibi ; sæva Leonum
 Semina nec unquam Scotica terra tulit.
 Nulla venena nocent, nec Serpens serpit in herba ;
 Nec conquesta canit garrula Rana lacu.
 In qua Scotorum gentes habitare merentur,
 Inclyta gens hominum milite, pace, fide.

Vide Hibernia Dominicana, page 8.

L E T T E R I V.

Portrush, August 3, 1784.

DEAR SIR,

IN riding from Ballycastle to Portrush, I went a short way off the beaten road, to see a whimsical little fishing rock, connected to the main land by a very extraordinary flying bridge ; it is called Carrick-a-rede, (or the rock in the road) and lies somewhat eastward from Ballintoy, on a most romantic shore.

I WAS quite delighted with the picturesque appearance of this little fanciful fishery, of which I must beg leave to give you a short account : However, as I am a great advocate

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in favour of Mr. Lock's system of a dictionary of pictures, in preference to a dictionary of tedious descriptions, I shall enclose you a drawing of Carrick-a-rede, from a sketch which my draftsman made on the spot.

At a particular season of the year the salmon fish come along the coast in quest of the different rivers in which they annually cast their spawn.—In this expedition the fish generally swim pretty close to the shore, that they may not miss their port; and the fishermen, who are well aware of this coasting voyage of the salmon, take care to project their nets at such places as may be most convenient for intercepting them in their course.

It so happens that Carrick-a-rede is the only place on this abrupt coast which is suited for the purpose.—Here then or no where must be the fishery—but how to get at the rock is the question.—A chasm full sixty feet in breadth, and of a depth frightful to look at, separates it from the adjacent land, in the bottom of which the sea breaks with an uninterrupted

interrupted roar over the rocks; the island itself is inaccessible on every side except one spot, where, under the shelter of an impending rock, a luxuriant herbage flourishes; but the wildness of the coast and the turbulence of the sea make it very difficult to land here.

IN this perplexity there is really no resource, except in attempting to throw a bridge of ropes from the main land to the island, which accordingly the fishermen every year accomplish * in a very singular manner. Two strong cables are extended across the gulph by an expert climber, and fastened firmly into iron rings mortised into the rock on either side. Between these ropes a number of boards about a foot in breadth are laid in succession, supported at intervals by cross cords,—and thus the pathway is formed, which, though broad enough to bear a man's foot with tolerable convenience, does by no

* This bridge is only thrown across during the time of the salmon fishery, which is carried on in the summer months.

means hide from view the pointed rocks and raging sea beneath, which in this situation exhibit the fatal effects of a fall in very strong colouring; while the swingings and undulations of the bridge itself, and of the hand rope, which no degree of tension can prevent in so great a length, suggest no very comfortable feeling to persons of weak nerves. — Upon the whole it is a beautiful bridge in the scenery of a landscape, but a frightful one in real life.

T H E mode of fishing on this coast is different from any I have seen, perhaps it may be new to you.

T H E net is projected directly outward from the shore, with a slight bend, forming a bottom in that direction in which the salmon come: From the remote extremity a rope is brought obliquely to another part of the shore, by which the net may be swept round at pleasure, and drawn to the land; a heap of small stones is then prepared for each person. All things being ready, soon as the
watchman

watchman perceives the fish advancing to the net, he gives the watch-word*—immediately some of the fishermen seize the oblique rope by which the net is bent round to enclose the salmon, while the rest keep up an incessant cannonade with their ammunition of stones, to prevent the retreat of the fish till the net has been completely pulled round them; after which they all join forces, and drag the net and fish quietly to the rocks.

THE salmon fisheries on the sea coast, and in the rivers of the north of Ireland, have sometimes been very productive, affording a valuable cargo for the Italian markets, during time of lent :—The abundance of fish may in some measure be inferred from hence, that fourteen hundred salmon (as I am informed) have been taken in the river Bann at once hauling the net; and what is almost equally remarkable, near one thousand were caught at the succeeding haul. At present, however, the fisheries are but scanty, and it

* At Portrush the word is *tarrying*.

is the prevailing opinion, that the too great success of the river fisheries has undone them, by destroying the mother salmon, which should be allowed free passage through the rivers to cast their spawn.

Now that I am got upon the subject of fishing, let me tell you of an amusing instance of sagacity which I had an opportunity of seeing a short time ago, in a water dog of this country, who had become a most excellent fisher.

IN riding from Portrush to the Giant's Causeway with some company, we had occasion to ford the river Bush, near the sea; and as the fishermen were going to haul their net, we stopped to see their success. As soon as the dog perceived the men to move, he instantly ran down the river of his own accord, and took post in the middle of it, on some shallows where he could occasionally run or swim, and in this position he placed himself with all the eagerness and attention so strongly observable in a pointer-dog

dog who *sets* his game.—We were for some time at a loss to apprehend his scheme, but the event soon satisfied us, and amply justified the prudence of the animal ; for the fish, when they feel the net, always endeavour to make directly out to sea. Accordingly one of the salmon, escaping from the net, rushed down the stream with great velocity, toward the ford, where the dog stood to receive him at an advantage.—A very diverting chase now commenced, in which, from the shallowness of the water, we could discern the whole track of the fish, with all its rapid turnings and windings. After a smart pursuit the dog found himself left considerably behind, in consequence of the water deepening, by which he had been reduced to the necessity of swimming. But instead of following this desperate game any longer, he readily gave it over, and ran with all his speed directly down the river, till he was sure of being again to seaward of the salmon, where he took post as before in his pointer's attitude.—Here the fish a second time met him, and a fresh pursuit ensued ; in which, after various attempts,

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the falmon at last made its way out to the sea, notwithstanding all the ingenious and vigorous exertions of its pursuer.

Though the dog did not succeed at this time, yet I was informed that it was no unusual thing for him to run down his game; and the fishermen assured me that he was of very great advantage to them, by turning the falmon toward the net; in which point of view his efforts in some measure corresponded with the cannonade of stones which I mentioned at Carrick-a-rede.

DURING the whole of the chase this sagacious animal seemed plainly to have two objects in view, one to seize his game, if possible; and the other, to drive it toward the net when the former failed; each of which he managed with a degree of address and ingenuity extremely interesting and amazing.

IT is somewhat unaccountable that mankind should look with so much horror and disgust on any remote similitude which some
of

of the brute creation bear to the human person and features, and yet dwell with pleasure on much nearer approaches toward their prerogative faculty of reason—At least thus much I am certain of, that we saw the exertions of this creature with infinite delight, and our regard for him seemed to encrease in proportion as our idea of his excellence encreased.—Perhaps it may be, that a consciousness of decided superiority in the latter case, makes us observe the ingenuity of lower animals without the allay of any uneasiness from an apprehension of rivalry.

L E T T E R V.

Portrush, August 6, 1784.

DEAR SIR,

YOU would hardly believe how little remains of Irish history, language or customs, are to be traced in this part of the country: The revolutions which it has undergone, in consequence of forfeitures to the English, and the encroachments of the Scots, have overturned every remnant of its original state.

DURING the time that the English were endeavouring to extend their pale, in every direction from the metropolis of the kingdom, over a desperate but disunited enemy,
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the Scottish clan of M'Donalds, who by an intermarriage had got footing in Ireland, began their ravages on the northern coast of Antrim ; and by the powerful support which they received from Cantire, and the western isles of Scotland, established their dominion over a tract of country near forty miles in length.

As the people of those days generally followed the fortune of their chief, the greater part of the native Irish who survived these bloody scenes, transplanted themselves elsewhere ; while the Scots remained peaceable possessors of the field.—Hence the old traditions and customs of the country were entirely lost ; and the few who speak the Celtic language at all, use a kind of mixed dialect, called here *Scotch-Irish*, which is but imperfectly understood by the natives of either country.

THE present possessors are in general an industrious thrifty race of people. They have a great deal of substantial civility, without
much

much courtesy to relieve it, and set it off to the best advantage.—The bold ideas of rights and privileges, which seem inseparable from their presbyterian church, renders them apt to be ungracious and litigious in their dealings.—On the whole, the middling and lower ranks of people in this quarter of the kingdom are a valuable part of the community ; but one must estimate their worth as a miner often does his ore, rather by its weight than its splendor.

THERE are three or four old castles along the coast, situated in places extremely difficult of access, but their early histories are for the greater part lost.—The most remarkable of these is the castle of Dunluce, which is at present in the possession of the Antrim family. It is situated in a singular manner on an isolated abrupt rock, which projects into the sea, and seems as it were split off from the terra firma. Over the intermediate chasm lies the only approach to the castle, along a narrow wall, which has been built somewhat like a bridge, from the rock to the adjoining land ;

land ; and this circumstance must have rendered it almost impregnable before the invention of artillery. It appears however, that there was originally another narrow wall, which ran across the chasm parallel to the former, and that by laying boards over these an easy passage might occasionally be made for the benefit of the garrison.

THE walls of this castle are built of columnar basalt, many joints of which are placed in such a manner as to shew their polygon sections ; and in one of the windows of the north side, the architect has contrived to splay off the wall neatly enough, by making use of the joints of a pillar whose angle was sufficiently obtuse to suit his purpose.

THE original lord of this castle and its territories, was an Irish chief, called Mc. Quillan, of whom little is known, except that, like most of his countrymen, he was hospitable, brave, and improvident ; unwarily allowing the Scots to grow in strength, until
they

they contrived to beat him out of all his possessions.

IN the course of my expeditions through this country, I met with an old manuscript account of the settlement of the Scotch here, of which I shall give you a short extract. It will serve in a good measure to shew the barbarous state of the inhabitants in the sixteenth century, and the manner in which property was so readily transferred from one master to another.

THE manuscript is in the hands of the Mc. Donalds, and therefore most likely speaks rather in their favour.

“ ABOUT the year 1580, Coll. Mc. Donald came with a parcel of men, from Cantire, to Ireland, to assist Tyrconnell against great O’Neal, with whom he was then at war.

“ IN

“ IN passing through the Root* of the county of Antrim, he was civilly received, and hospitably entertained, by Mc. Quillan, who was then lord and master of the Root.

“ AT that time there was a war between Mc. Quillan and the men beyond the river Bann, for the custom of this people was, to rob from every one, and the strongest party carried it, be it right or wrong.

“ ON the day when Coll. Mc. Donald was taking his departure to proceed on his journey to Tyrconnell, Mc. Quillan, who was not equal in war to his savage neighbours, called together his militia or gallogloghs, to revenge his affronts over the Bann ; and Mc. Donald, thinking it uncivil not to offer his service that day, to Mc. Quillan, after having been so kindly treated, sent one of his gentlemen with an offer of his service in the field.

* A term by which this north west part of the county of Antrim is always denominated.

“ MC. QUILLAN was right well pleased with the offer, and declared it to be a perpetual obligation on him and his posterity. So Mc. Quillan and the highlanders went against the enemy, and, where there was a cow taken from Mc. Quillan’s people before, there were two restored back : after which Mc. Quillan and Coll. Mc. Donald returned back with a great prey, and without the loss of a man.

“ WINTER then drawing nigh, Mc. Quillan gave Coll. Mc. Donald an invitation to stay with him at his castle, advising him to settle himself until the spring, and to quarter his men up and down the Root. This Coll. Mc. Donald gladly accepted ; and in the mean time seduced Mc. Quillan’s daughter, and privately married her ; on which ground the Scots afterward founded their claim to Mc. Quillan’s territories.

“ THE men were quartered two and two through the Root, that is to say, one of Mc.

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Quillan’s

Quillan's gallogloghs and a highlander in every tenant's house.

“IT so happened that the galloglogh, according to custom, besides his ordinary, was entitled to a meather* of milk, as a privilege.—This the highlanders esteemed to be a great affront; and at last one of them asked his landlord,—“ Why do you not give
 “ me milk as you give to the other?”—
 The galloglogh immediately made answer,
 “ Would you, a highland beggar as you
 “ are, compare yourself to me, or any of
 “ Mc. Quillan's gallogloghs?”

“ THE poor honest tenant, (who was heartily weary of them both) said, “ Pray,
 “ gentlemen, I'll open the two doors, and
 “ you may go and fight it out in the fair
 “ fields, and he that has the victory let him
 “ take milk and all to himself.”

* A vessel commonly used by the old Irish, formed out of one solid piece of wood, and most commonly of a triangular shape.

“ THE combat ended in the death of the galloglogh ; after which, (as my manuscript says) the highlander came in again and dined heartily.

“ MC. QUILLAN’S gallogloghs immediately assembled to demand satisfaction ; and in a council which was held, where the conduct of the Scots was debated, their great and dangerous power, and the disgrace arising from the seduction of Mc. Quillan’s daughter, it was agreed that each galloglogh should kill his comrade highlander by night, and their lord and master with them ; but Coll. Mc. Donald’s wife discovered the plot, and told it to her husband—So the highlanders fled in the night time, and escaped to the island of Raghery.

“ FROM this beginning, the Mc. Donalds and Mc. Quillans entered on a war, and continued to worry each other for half a century, till the English power became so superior in Ireland, that both parties made an

appeal to James the First, who had just then ascended the throne of England.

“ JAMES had a predilection for his Scotch countryman, the Mc. Donald, to whom he made over by patent four great baronies, including, along with other lands, all poor Mc. Quillan's possessions. However, to save some appearance of justice, he gave to Mc. Quillan a grant of the great barony of Enishowen, the old territory of O'Dogherty, and sent to him an account of the whole decision by Sir John Chichester.

“ MC. QUILLAN was extremely mortified at his ill success, and very disconsolate at the difficulties which attended the transporting his poor people over the river Bann, and the Lough Foyle, which lay between him and his new territory. The crafty Englishman, taking advantage of his situation, by an offer of some lands which lay nearer his old dominions, persuaded him to cede his title to the barony of Enishowen. And thus the Chichesters,

chesters, who afterwards obtained the title of Earls of Donegal, became possessed of this great estate; and honest Mc. Quillan settled himself in one far inferior to Enishowen.

“ONE story more (says the manuscript) of Mc. Quillan—The estate he got in exchange for the barony of Enishowen was called Clancraaghurkie*, which was far inadequate to support the old hospitality of the Mc. Quillans. Bury Oge Mc. Quillan sold this land to one of Chichester’s relations, and having got his new granted estate into one bag, was very generous and hospitable as long as the bag lasted. And so (continues the manuscript) was the worthy Mc. Quillan soon extinguished.”

I SHOULD not have obtruded the account of the downfall of this Irish chief, but that it affords so good a reason for the utter obliteration of every ancient record and monument

* It is in another place called Clancaghguikie.

70 L E T T E R S C O N C E R N I N G T H E

in this part of the country ; and will plead my excuse for not adding somewhat to our collection of Irish antiquities.

L E T T E R

L E T T E R VI.

Portrush, August 13, 1784.

DEAR SIR,

A FEW days ago, as I rode across the headland of Bengore, a sudden shower of rain falling very heavily, compelled me to take shelter in a little cabin, which stands on a wild spot in the middle of that promontory, on a piece of land called in the Irish language Aird, from the loftiness of its situation. —A well-looking young woman sat by the fire-side spinning at her wheel, with a parcel of children playing round her; but, notwithstanding her industrious employment, the house bore evident marks of poverty and distress about it.

As the rain still continued, I had an opportunity of asking several questions concerning the fortunes of this poor family, the history of which forms such a simple, melancholy tale, that I cannot help repeating it to you, though methinks you will accuse me of having brought it forward very *mal a-propos*.

THE original adventurer who settled in this solitary spot was called Adam Morning, a name which he got from some accidental circumstance, and is described by the peasants of the neighbouring hamlet, as a clever fellow, and an honest man. He held his little farm, which had never before been cultivated, at the small rent of five pounds per annum, hoping soon to render it a valuable tenure by the probable effects of his industry; and on this he built the cottage which I have just mentioned, suited to his infant powers, but so contrived as to admit of an addition, whenever his success in improving this barren soil should entitle him to encrease his comforts.

By

By hard labour he soon reclaimed so much of the land as enabled him to sow a moderate quantity of grain ; but when the toils of the year were almost over, and a plentiful harvest promised to reward his industry, a violent storm, which was severely felt over the whole kingdom, blasted his golden hopes, and the entire produce of his farm was only sixteen barrels of oats, out of twenty-four which he had sowed.

THIS was a severe blow to our enterprising farmer, but his resolution was not thus hastily to be vanquished ;—means were found to pay his rent, a second crop was sowed the ensuing year, and his land again presented the cheering prospect of approaching plenty. Once more an inclement season, bearing heavily on the unsheltered situation of his new fields, mocked his expectation, and the entire reward of the year's labour amounted only to a small increase of grain, little exceeding what he had sowed.

FEW men in this lowly sphere of life would have borne up against such rude and repeated shocks of adverse fortune ; but the spirit of our humble adventurer disdained to yield to misfortunes which were merely casual, and which no degree of prudence could have guarded against.—His perseverance was still unshaken, his health continued vigorous, and the land yet promised to repay him, would providence but smile on his endeavours.—New ways were therefore devised to save his sinking credit ; every nerve was exerted to pay his rent, and try the fortune of another year.

THERE is a small bay in the promontory of Bengore, called Port na Spania*, from the wreck of one of the celebrated Spanish Armada, which was here dashed to pieces.

* The path of descent to Port na Spania lies in the land of a peasant who is not entitled to any part of the sea coast, but he receives, as a toll on his highway, every third hundred of kelp manufactured below—and this path, dangerous as it is, yet being the only one, makes it necessary to comply with the demand.

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It is entirely furrounded by a monstrous precipice between three and four hundred feet high, and is accessible only by one narrow approach, which is far the most frightful of all the hazardous paths on this whole coast.

By the tenure of his farm the possessor was entitled to a quarter of this little bay, amounting to about twenty or thirty square yards of wild inhospitable rock*.

HERE Adam and his family, struggling against their distresses, laboured hard to supply their wants by cutting the sea weed from the rocks, and manufacturing it into kelp, which the linen bleachers of the country bought up at a good price; while in the mean time the farm was rising fast, and Ceres began again to smile propitious.

* The whole bay generally produces about four tons of kelp, which is sold at the rate of from five to six pounds per ton.

ONE morning, as Adam and his wife were descending down the dangerous path, to pursue their daily toil, while they were yet talking of their growing hopes, even while the chearful prospect was smiling in their view, a sudden slip tumbled him headlong from the precipice, and dashed him to pieces on the rocks below*.

HIS son David, the heir of his humble fortunes, had just then returned from the West Indies, still crippled under a wound which he received in the service of his country on board a man of war, but prepared to assist the distresses of his father with the little prize money which had fallen to his share during his voyages.

THE tar had married a pretty young woman before he went to sea, (the same whom I saw busied in spinning) but instead of returning to a quiet happy family, he found nothing at home

* This melancholy accident happened in the summer of 1783, when I was in this neighbourhood.

but misery and distress, and saw himself almost entirely adrift in the world, with a mother, a wife and children to maintain. The death of his father had brought all the hungry creditors forward, so that he became heir only to the poor cottage itself, and the naked land which surrounded it. However, it was his inheritance, and as such he would not part with it.

THE prize money which he had got on his cruise was for the convenience of carriage (as his wife told me) mostly converted into plate; that is, he returned home with a silver watch, a large pair of silver knee and shoe buckles, and such other little matters of ornament as the vanity of a sailor, who pays a visit to his old friends after a long absence, commonly delights to exhibit. With these David set out for the first fair that happened in the neighbourhood to buy a horse, which was absolutely necessary for the cultivation of his farm. But he was not in his own element. A jockey soon fell in with him, and the tar gave his silver watch, the chief fortune

fortune of the family, for a jaded horse whom he afterward found, on enquiry, old enough to have seen the days of Lord Hawke and Conflans, being upwards of twenty years of age.

OUR young farmer, alarmed at the marks of debility which too manifestly shewed themselves in his new horse, and terrified lest he might hastily give him the slip, and die in his hands, set out with all expedition to try his fortune at market once more; where, with the assistance of another piece of plate, he soon bartered his antiquated steed, and, under the influence of his late misfortune, purchased a colt almost as unserviceable from his youth, as the former had been from extreme old age.

THESE calamities of the son were little less ruinous than those of his father, but with this difference, that the misfortunes of the latter being such as no human foresight could have prevented, he was universally esteemed and pitied by the neighbourhood; while every
body

body laughed at the simplicity which involved poor David in his distresses.

HOWEVER, some peasants of the next village, pitying his situation, admitted him into what is here called a *neighbour dealing*, that is, he was allowed to join his colt in the team with three of their horses, and the plough was alternately employed in each man's farm; by this means David has been enabled to till his inheritance, and this year a harvest of rich hope seems to promise a reward—whether it shall or not rests with Providence.

SUCH is the simple unadorned history of this poor family, affording an artless affecting picture of the accidents and distresses of humble life, which I am sure will interest your feelings, and make you forget the tediousness of this digression from my main subject.

L E T T E R VII.

Portrush, August 20, 1784.

DEAR SIR,

IT is a pleasing, as well as interesting pursuit, to observe the gradual advancement of mankind in any particular object of enquiry; to trace the wild shoot of infant philosophy from the natural soil, in which it has grown rank and uncultivated, to the garden of science, where it blooms in all the improved beauty and vigour which the hand of art and industry can add to it. In this point of view a little history of the opinions which have prevailed concerning the curious combination of pillars in this neighbourhood, called the Giants Causeway, may

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perhaps

perhaps afford you some amusement ; and if it do not bring with it much solid information concerning the operations of nature, yet it may be pleasant enough to see the various attempts which men have made to explain them.

THE native inhabitants of the coast, as they were the earliest observers of this wonder, so were they the first to account for its production ; and however rude and simple their theory may be, yet a little consideration will satisfy us that it does not deserve the ignominious appellation of being grossly barbarous and absurd. The Causeway was observed by the fishermen whose daily necessities led them thither for subsistence, to be a regular mole, projecting into the sea, which answered for several convenient purposes ; on closer inspection, it was discovered to be built with an appearance of art and regularity somewhat resembling the works of men, but at the same time exceeding every thing of the like kind which had been seen : And it was found that human ingenuity and perseverance,

if

if supported by sufficient power, might be abundantly adequate to its production.

THE chief defect in this simple analogy seems to have been the want of strength equal to the effect; but this was soon supplied in the traditions of a fanciful people, and Fin ma Cool*, the celebrated hero of ancient Ireland, became the giant under whose forming hand this curious structure was erected.

IT was afterward discovered, that a pile of similar pillars was placed somewhere on the opposite coast of Scotland, and as the business of latitudes and longitudes was not at that time very accurately ascertained, a general confused notion prevailed that this mole was once continued across the sea, and connected the Irish and Scottish coasts together.

NEAR the end of the last century, when this kingdom began to revive from its misfor-

* Mr. Mc. Pherson's more modern Fingal.

tunes under the regulations of William the Third, the spirit of enquiry, which the Royal Society of London had just then called forth, began to busy itself about this singular and original wonder. At this period we find, among the papers of the Society, a letter from Sir Richard Bulkley to Doctor Lyfter on this subject, dated in the year 1693, of the merits of which you may judge by the following extract :

“ CONCERNING the Giants Causeway.—
 “ Prolixity in a philosophical description I’m
 “ sure you’ll pardon, for I was very exact
 “ in getting it from a person that was *Rei*
 “ *Compos*, perhaps *Peritus*. A scholar, a
 “ master of arts in Cambridge, and a tra-
 “ veller, who went on purpose with the
 “ Bishop of Derry to see it, &c.

“ This whole Causeway (says the scholar)
 “ consists of pillars of perpendicular *cylinders*.
 “ The pillars do not consist of joints as you
 “ were informed, but each cylinder is one
 “ solid piece, only indeed in breaking it
 “ breaks

“ breaks crosswise, and not lengthwise, which
 “ we commonly call splitting. And all the
 “ stones that rise up on the strand are all
 “ cylinders, though of never so many dif-
 “ ferent angles, for there are also four
 “ squared upon the same shore*.—That the
 “ cylinders do not consist of joints is evident
 “ from hence, that the pieces so broken off
 “ have their bottoms as often convex or con-
 “ cave, as flat or even.”

THUS has this intelligent traveller demon-
 strated that these pillars have no joints, from
 the very circumstance which of all others
 renders their articulation most curious and
 surprising.

IN consequence of the information which
 this gentleman gave of the want of joints,

* With all due deference to this Cambridge master of
 arts, who so scientifically describes these four squared cy-
 linders, he must have made some very unaccountable mis-
 take, or else matters have been strangely altered since his
 time, for there is not now a single pillar to be found in
 the whole Causeway which is not clearly separable into very
 many distinct joints.

people

people began to compare these pillars with the regular fossils then best known, the Entrochi, Asteriæ, and the rock Crystal, which, on a diminutive scale, seemed to bear resemblance with the larger masses in the Giants Causeway; and to this end a number of quæries were drawn up by Sir Richard Bulkley, which, with their answers by Doctor Samuel Foley, are published in the Philosophical Transactions of that period.

SUCH are these following :

“ ARE any of the pillars hexagons, or
“ squares? or be they pentagons only?”

“ HAVE the tops of the pillars any gravings
“ or striate lines on them?”

“ Is the superficies caniculate or otherwise
“ grooved?” &c. &c.

ALL which quæries, though truly enough answered, yet produced very little useful information; being entirely directed to the
mere

mere exterior appearance of the Causeway itself, without paying any attention to the general features of the coast, to the attendant fossil substances, or even to the nature and chemical properties of the stone itself, which is utterly different from those fossils with which it was then compared. However, the British philosophers seem to have pursued the analogy of this species of crystallization with very great confidence; so that the authors of the late appendix to their *Encyclopædia* have endeavoured to give it an air of probability, by delineating many of the basalt pillars as terminating in pyramids, like the common rock crystal, and some species of salts*.

To these answers a sketch was added, of which an engraving is published in the *Phi-*

* This representation of the pillars has probably been taken from a drawing of the basaltés of Saxony, sent many years ago to Gesner, together with a description of that species of stone by Kentman: This drawing contains many errors, and among the rest exhibits pillars of basaltés with conical terminations.

lofophical Tranfactions; entitled, “A Draught
 “ of the Giants Caufeway which lies near
 “ Bengore Head, in the County of Antrim,
 “ by Chriſtopher Cole. A. D. 1694.” Of
 this drawing and its imperfections, the account which Doctor Foley himſelf gives will be the beſt deſcription.—“ He tells me he
 “ has not drawn the Giants Caufeway as
 “ a proſpect, nor yet as a ſurvey or platform,
 “ for this he thought would not anſwer his
 “ deſign; and that he has no name for it
 “ but a draught, which he took after this
 “ fort. He ſuppoſed the hills and cauſe-
 “ way to be epitomiſed to the ſame height
 “ and bigneſs the draught ſhews them, and
 “ this he fancied the moſt intelligible way
 “ to expreſs it.

DOCTOR Thomas Molleneux was the firſt perſon who took any very conſiderable pains to procure information concerning the Giants Caufeway, and we have reaſon to lament that the neceſſary attendance of his profeſſion prevented him from making his obſervations in perſon, for which he ſeems to
 have

have been well qualified: However, his intelligence was the best that had yet been collected. It was found that this species of stone was not confined to the Giants Causeway alone, but might be discovered in the mountain of Dunmull; nay that it was certainly of the same species with the Lapis Misneus, or basaltes of Stolpen, in Saxony, of which a flight description had been given by Agricola, in his History of Fossils.

By the influence of this gentleman in the Dublin Society, that body employed a painter of some eminence to make a general sketch of the coast near the Causeway; but neither the talents nor fidelity of the artist seem to be at all suited to the purpose of a philosophical landscape.

AN engraving of this is published under the following title:

“ A true Prospect of the Giants Cause-
 “ way near Bengore Head, taken from the
 “ North West, by Edward Sandys, A. D.
 “ 1696,

90 LETTERS CONCERNING THE

“ 1696, at the Expence of the Dublin So-
ciety.

“ Right Hon. Sir Cecil } President.
“ Week, Knt.

“ Rev. Dr. Ashe, Bishop } Vice - Presi-
“ of Cloyne, dents.”
“ William Molleneux, Esq; }

IN this *true* prospect, the painter has very much indulged his own imagination at the expence of his employers, infomuch that several tall pillars in the steep banks of this fanciful scene appear loaded with luxuriant branches, skirting the wild rocky bay of Port Noffer* with the gay exhibition of stately forest trees. In the back ground he discovered a parcel of rude and useless materials, which his magic pencil soon transformed into comfortable dwelling-houses, and for chimneys he has happily introduced some detached pillars of basalt, which from their peculiar situation, and the name given to

* This bay lies immediately eastward from the Causeway. I have here written the name nearly as it is pronounced by the natives, who have scarce any knowledge of the Irish language; but the proper mode of writing it should be Port na Bfathach, which signifies the Giants Port.

them by the peasants of the country, naturally excited the attention of this extraordinary artist. And thus were concluded the labours of the last century concerning this curious work of nature.

FROM that period, the basalt pillars of this kingdom passed almost unnoticed for half a century, and seem to have been viewed cautiously, and as it were at a distance, by men of science, who appeared slow to engage with an object which had hitherto entirely baffled the attempts of every theorist.

IN the year 1740 Mrs. Susannah Drury made two very beautiful and correct paintings of the Giants Causeway, which obtained the premium appointed for the encouragement of arts in Ireland; and these drawings being soon after engraved by the hand of an eminent artist, and published, the attention of the world was once again directed toward this antiquated subject.

SHORTLY after this, Doctor Pococke, a gentleman of considerable industry in philosophical

phical pursuits, made a tour through the county of Antrim, and was the only person who appears to have taken a general view of the coast, of which he has given a cursory description. But not content with a plain history of matters of fact, the learned Doctor ventured to start a new theory of his own, which I fear will not stand the test of a critical examination: To say the truth, it is little else than the doctrine of the Atoms of Epicurus in a modern dress*.

HE conceives that the basaltic might once have been suspended in a watery medium, either in solution, or as a kind of mud: That at certain times, accidental fits of precipitation took place, in such manner as to form a range of short cylinders, whose upper ends should chiefly be convex: That as these joints became somewhat solid, a second fit of precipitation took place, forming a se-

* Ille censet, in infinito inani, in quo nihil nec summum, nec infimum, nec medium, nec ultimum, nec extremum sit; ita ferri ut concurfionibus inter se coherescant: ex quo efficiantur, ea quæ sint, quæque cernantur omnia.

cond range of incumbent joints, which must generally be concave, adapted to the convexity of the lower order, and thus, by successive fits of precipitation, he supposes a set of erect cylinders might be generated in contact with each other. Now a set of cylinders can touch only in right lines, and therefore must leave empty spaces between them; but the pillars being yet soft, and yielding to the encreasing pressure from above, should, he imagines, dilate, and spread themselves out so as to fill up the vacuities. And thus he conceives may the polygon, articulated pillars, of the Giants Causeway, be generated.

I SHALL not delay you by any commentary on this unhappy theory, only to observe, that a more accurate enquiry would have discovered horizontal and even curved pillars, for the production of which this cause is utterly inadequate*.

SUCH

* Mr. D'Acosta, who has published this account of Doctor Pococke's in his History of Fossils, strangely ranks
the

SUCH is the history of the Giants Causeway, and such have been the labours of the learned, and their various opinions concerning its structure, in which, whatever may have been already accomplished, much certainly remains to be done, towards a judicious arrangement of a sufficient number of materials, whereon to build any general theory to satisfy a reasonable mind, with respect to its formation.

IN my last letter I mentioned that the extent of country contiguous to the Causeway, through which all the varieties of this species of stone prevailed, was much greater than had been imagined: And within these few years, it has been discovered abroad, that

the basaltic among the class of marbles, or stones allied to marbles, with which it has not any one common feature of resemblance, except that it will receive a polish; so that he might with equal propriety have classed it with any other hard substance in nature. In truth he seems to be very ill informed on the subject, imagining this to be the only stone of the kind ever discovered, and is in amaze to think how far it may extend into the sea.

the

the basalt is a very common fossil through every part of the world, there being few kingdoms where it may not be found under one shape or another. Hence it has come to pass that the observations of men of science in distant places have been united on this subject; different theories have been compared together: and more general analogies suggested, on which to build some rational conjectures, concerning the cause that might have produced these wonderful pillars.

It is somewhat singular, however, that during these enquiries abroad, all appeals which have been made to the Giants Causeway, in favour of any particular system, have always proved fallacious; and still more extraordinary, when one considers that these errors should have principally arisen from the extreme pains employed in describing it, particularly from those two accurate and beautiful drawings executed by Mrs. Drury, which have really been a stumbling block to most of the foreign writers on this subject. Thus

Monf.

Monf. Demareft, the ingenious father of the volcanic theory of bafaltes, ftangely imagines that the caufeway has been a current of lava erupted from the fide of a conical mountain, though there is not a mountain of any fort in its vicinity, nor one of that particular fhape within a great many miles of it.—The truth is, that gentleman faw thefe much celebrated drawings, and has miftaken the fegment of a fhelving cape, at whole bafe the pillars ftand, for a portion of a conical hill cut down in the direction of its axis ; and this error has been confirmed by the prevailing custom of putting thofe pictures together in the fame frame ; fo that the two fegments, ftanding back to back, exhibit the appearance of an entire conical mountain, fuch as Mr. Demareft defcribes *.

IT

* Je tirai de cette conformité reconnu, un confequence que la force de l'analogie m'autorifoit a tirer : cette confequence me fit voir, dans la Chauffee de Geans, & dans toute le Maffes prifmatiques que fe montrent fur le bord efcarpes de la Mere en Ireland, en un Mot dans le Sommet tronques, q'on y'apperçoit, l'ouvrage des eruptions, d'un

It was also observed by foreigners, that in every drawing and description of the Giant's Causeway, particular attention was paid to the circumstance of its projecting into the sea; hence a crude and indefinite opinion was adopted by many writers, that the pillars of basalt were produced by the refrigeration of a liquid body of lava, in consequence of being suddenly plunged into water. Such is the theory of a Mr. Raspe, who has published an account of the valley of Hesse Cassel in Germany; and such are the sentiments advanced by Mons. De Luc, in his excellent Letters addressed to the Queen of England, in which he gives as his opinion, that the ancient volcanos were formed in the ocean, where the sudden cooling of the melted mass (not to count on the presence of the marine salt) might have determined a regularity of figure in the cooling body*.

THOUGH

d'un ou de plusieurs Volcans, qui se sont éteints, comme ceux des Auvergne.—See Mons. Demarest's *Memoir on the Basalt of Auvergne*, in the *Volume of the French Academy for 1771*.

* Or, on voit une cause de plus, dans les Volcans anciens, que dans les modernes, pour produire cet effet;

THOUGH this opinion does, with much ingenuity, assign a reason why the basaltic pillars are not produced at this day, as they were formerly ; yet a little consideration will shew that it ought not hastily to be adopted ; since general experience teaches us that all tumultuary causes are only adapted to introduce tumultuary effects : Every species of regular figure produced by chrySTALLIZATION, or any mode whatever analogous to it, being always more perfect, in proportion as length of time, and rest, have allowed the different particles to unite gradually ; indeed a moment's reflection must satisfy any one, that the furious encounter of a river of liquid fire with the waters of the ocean, so far from being suited to form the neat and elegant arrangement of our pillars of basaltes, can only tend to introduce confusion and irregularity.— But in truth, any argument derived from the

c'est de s'être formes dans la Mer, ou, sans compter la presens du Sel, l'attouchement seul de l'eau, en produisant un condensation plus subite, a pu être un circonstance determinante.

De Luc Lettres a la Reine de Grande Bretagne.

particular

particular situation of the Giant's Causeway will be found extremely erroneous; because the circumstance of its standing in the sea, is purely accidental; similar pillars being often discoverable on the summit of the highest grounds in its neighbourhood, many hundred feet above the level of the beach.

I SHALL no longer weary your patience by a more minute account of the opinions to which this celebrated Causeway has given birth; but shall hasten to a general view of the bold volcanic theories that have been advanced to explain the production of the pillars of basalt.

L E T T E R VIII.

Portrush, August 24, 1784.

DEAR SIR,

THE vicinity of the little fishing village of Portrush to the Giant's Causeway, has afforded me, during my stay here, ample opportunity to visit that curious work of nature, and to examine, with a good deal of attention, the features of the adjoining country, which has hitherto been very imperfectly known.

THE Causeway itself is generally described as a mole or quay, projecting from the base of a steep promontory, some hundred feet into the sea, and is formed of perpendicular
pillars

pillars of basaltes, which stand in contact with each other, exhibiting an appearance not much unlike a solid honeycomb. The pillars are irregular prisms, of various denominations, from four to eight sides *; but the hexagonal columns are as numerous as all the others together.

ON a minute inspection, each pillar is found to be separable into several joints, whose articulation is neat and compact beyond expression; the convex termination of one joint, always meeting a concave socket in the next; besides which, the angles of one frequently shoot over those of the other, so that they are compleatly locked together, and

* Monsieur Faujas de St. Fond took much pains to search for pillars of nine sides among the basaltes of Viverrais, in consequence of the account which Mr. Molleneux and Monsieur de Lisle gave that such were to be found; but there is little doubt that both those gentlemen were mistaken, as none of that denomination are to be discovered at the Giant's Causeway or its neighbourhood. Indeed octagonal pillars are very rarely to be met with.

can rarely be separated without a fracture of some of their parts.

THE sides of each column are unequal among themselves, but the contiguous sides of adjoining columns are always of equal dimensions, so as to touch in all their parts.

THOUGH the angles be of various magnitudes, yet the sum of the contiguous angles, of adjoining pillars, always makes up four right ones.—Hence there are no void spaces among the basaltic, the surface of the causeway exhibiting to view a regular and compact pavement of polygon stones.

THE outside covering is soft, and of a brown colour, being the earthy parts of the stone nearly deprived of its metallic principle by the action of the air, and of the marine acid which it receives from the sea*.

* This coating contains iron which has lost its phlogiston, and is nearly reduced to a state of calx; for with a very moderate heat it becomes of a bright red ochre colour, the attendant of an iron earth.

THESE

THESE are the obvious external characters of this extraordinary pile of basalt, observed and described with wonder by every one who has seen it. But it is not here that our admiration should cease;—whatever the process was by which nature produced that beautiful and curious arrangement of pillars so conspicuous about the Giant's Causeway; the cause, far from being limited to that spot alone, appears to have extended through a large tract of country, in every direction, inasmuch that many of the common quarries, for several miles around, seem to be only abortive attempts towards the production of a Giant's Causeway.

FROM want of attention to this circumstance, a vast deal of time and labour has been idly spent in minute examinations of the Causeway itself;—in tracing its course under the ocean—pursuing its columns into the ground—determining its length and breadth, and the number of its pillars—with numerous wild conjectures concerning its
original;

original; all of which cease to be of any importance, when this spot is considered only as a small corner of an immense basalt quarry, extending widely over all the neighbouring land.

THE leading features of this whole coast are the two great promontories of Bengore and Fairhead, which stand at the distance of eight miles from each other: Both formed on a great and extensive scale, both abrupt toward the sea, and abundantly exposed to observation, and each in its kind exhibiting noble arrangements of the different species of columnar basaltes.

THE former of these lies about seven miles west of Ballycastle, and is generally described by seamen, who see it at a distance and in profile, as an extensive headland, running out from the coast a considerable length into the sea; but, strictly speaking, it is made up of a number of lesser capes and bays, each with its own proper name, the *tout ensemble* of which

which forms what the seamen denominate the headland of Bengore.

THESE capes are composed of variety of different ranges of pillars, and a great number of strata; which, from the abruptness of the coast, are extremely conspicuous, and form an unrivalled pile of natural architecture, in which all the neat regularity and elegance of art is united to the wild magnificence of nature.

THE most perfect of these capes is called Pleaskin, of which I shall attempt a description, and along with it hope to send a drawing which my draftsman has taken from the beach below at the risque of his neck; for the approach from these promontories down to the sea is frightful beyond description, and requires not only a strong head, but very considerable bodily activity to accomplish it.

THE summit of Pleaskin is covered with a thin grassy sod, under which lies the natural
rock,

rock, having generally an uniform hard surface, somewhat cracked and shivered. At the depth of ten or twelve feet from the summit, this rock begins to assume a columnar tendency, and forms a range of massy pillars of basalt, which stand perpendicular to the horizon, presenting, in the sharp face of the promontory, the appearance of a magnificent gallery or colonade, upward of sixty feet in height.

THIS colonade is supported on a solid base of coarse, black, irregular rock, near sixty feet thick, abounding in blebs and air-holes—but though comparatively irregular, it may be evidently observed to affect a peculiar figure, tending in many places to run into regular forms, resembling the shooting of salts and many other substances during a hasty crystallization.

UNDER this great bed of stone stands a second range of pillars, between forty and fifty feet in height, less gross, and more sharply defined than those of the upper story, many
of

of them, on a close view, emulating even the neatness of the columns in the Giant's Causeway. This lower range is borne on a layer of red ochre stone, which serves as a relief to shew it to great advantage*.

THESE two admirable natural galleries, together with the interjacent mass of irregular rock, form a perpendicular height of one hundred and seventy feet; from the base of which, the promontory, covered over with rock and grass, slopes down to the sea for the space of two hundred feet more, making in all a mass of near four hundred feet in height, which in beauty and variety of its colouring, in elegance and novelty of arrangement, and in the extraordinary magnitude of its objects, cannot readily be ri-

* The only instances of different ranges of basaltes that have hitherto been discovered, occur in the valuable work of Mons. Fajjas de St. Fond on the volcanoes of Viverrais, &c. but the arrangement which appears there, even with the neatness that always attends an engraving, is greatly inferior to that of Pleaskin.

valled by any thing of the kind at present known*.

THOUGH there are but two complete ranges of pillars which appear in any of the promontories, yet it is not improbable that there may be many more in succession, at various depths under ground; and this opinion is confirmed by columnar marks which may be traced in several rocks that lie in the sea. The Causeway itself, which is situated at the base of one of those promontories, on the level of the beach, is one of those columnar beds that has been accidentally stripped and washed by length of time and storms.

THE pillars of this whole headland appear naturally to affect a perpendicular situation,

* Mr. Pennant is much mistaken in his opinion that the little island of Staffa, whose greatest height is but one hundred and twenty-eight feet, contains any object equal to the bold promontories of Bengore.—Neither are the best specimens of pillars at Staffa at all comparable to those of the Giant's Causeway in neatness of form, or singularity of articulation.

and

and in the few places where they lie in an inclined posture, it seems to be the effect of some external cause, which has deranged them from their original disposition. Indeed where the forms of crystallization are imperfect, they may be seen to shoot in various directions, and sometimes in irregular curves, but in most of these instances the columnar outline is very rude and unfinished.

It is worth remarking, that the ranges of pillars are more perfect in proportion as they lie deeper under ground; the second range in Pleaskin is evidently better finished than the upper one, and contains much fewer irregularities in the grain of its stone; while the pillars of the Causeway, which runs into the sea itself, have still a greater sharpness in their figure, and are more close and uniform in their texture,

SUCH is the general outline of this great headland, which affords objects extremely interesting to every one who may wish to study nature in her bold and uncommon works.

AT

AT the distance of eight miles from hence (as I mentioned before) the promontory of Fairhead * raises its lofty summit more than four hundred feet above the sea, forming the eastern termination of Ballycastle bay. It presents to view a vast compact mass of rude columnar stones, the forms of which are extremely gross, many of them being near one hundred and fifty feet in length, and the texture so coarse †, as to resemble black schorle stone, rather than the close fine grain of the Giant's Causeway basaltes. At the base of these gigantic columns lies a wild waste of natural ruins, of an enormous size, which in the course of successive ages have been tumbled down from their foundation by storms, or

* This is the Robogdium Promontorium of Ptolemy the geographer.

† These pillars do not at first view appear to have any marks of articulation; but on observing such as have fallen down from the top of Fairhead, they are found to be often separated into pretty regular joints by the force of the fall,

some

some more powerful operations of nature. These massive bodies have sometimes withstood the shock of their fall, and often lie in groups and clumps of pillars, resembling many of the varieties of artificial ruins, and forming a very novel and striking landscape.

A SAVAGE wildness characterizes this great promontory, at the foot of which the ocean rages with uncommon fury. Scarce a single mark of vegetation has yet crept over the hard rock to diversify its colouring, but one uniform greyness clothes the scene all around. Upon the whole, it makes a fine contrast with the beautiful capes of Bengore, where the varied brown shades of the pillars, enlivened by the red and green tints of ochre and grass, casts a degree of life and cheerfulness over the different objects.

THOUGH I have particularly described the basalt pillars of these two magnificent promontories, yet there are many other similar arrangements through this country, which, though less worthy of admiration as great objects,

objects, yet become extremely interesting when one wishes to search minutely into the natural causes which might have produced these extraordinary pillars.

THE mountain of Dunmull, lying between Coleraine and the river Bush, abounds in this species of stone, particularly at the craigs of Islamore, where two different ranges of columns may be discovered; and at most of the quarries which have occasionally been opened round the mountain.—They may be seen also at Dunluce-hill, near the castle of Dunluce:—In the bed of the river Bush, near the bridge of Bushmills:—On the summit of the mountain of Croaghmore:—In many parts of the high land over Ballintoy:—In the island of Raghery; and various other places, through an extent of coast about fifteen miles in length, and two in breadth*.

I SHALL

* Beyond this tract, which abounds in perfect pillars, an attentive observer will be able to trace the same species of fossils in very distant parts of the country, as far as the

I SHALL not at present delay you with a minute description of each of these, but may, in the course of my Letters, take an opportunity to mention the general character of the face of this country, and any singularities worthy notice, in the forms and situation of its basaltic.

Yours, &c.

northern shore of Loughneagh, and the mountains of the county of Derry ; in many places of which, imperfect columnar forms may be observed ; so that the great cause which generated this species of stone, has been exerted through a space of more than forty miles in length, and twenty in breadth ; that is, through above eight hundred square miles.

LETTER

L E T T E R IX.

Portrush, August 13, 1784.

DEAR SIR,

I N my last letter I described the external character of the Giant's Causeway pillars, which will abundantly serve to discriminate the columnar basaltes from any other fossil of a different species, at present known. But as this stone does not always appear in its prismatical form, it will be convenient to take notice of some other properties, not immediately derived from its figure, by which we shall be enabled to distinguish it in those instances where it may be disposed in more rude and irregular masses.

THE basalt^{es} of the Giant's Causeway* is a black, ponderous, close-grained stone; which does not effervesce in any of the mineral acids.

Its specific gravity is to that of water, nearly in the proportion of 2,90 to 1,00— and to that of the finest marble as 2,90 to 2,70.

THOUGH its texture be compact, it is not absolutely homogeneous; for, if ground to a smooth surface, its bright jet-black polish is disfigured by several small pores.

IT strikes fire imperfectly with a steel.

WHEN exposed to a moderate heat in a common fire, it assumes a reddish colour, which is more vivid on its natural outside co-

* I have intentionally confined this account to the stone of the Giant's Causeway, because it seems as perfect in its kind as any hitherto discovered, and may in some measure serve for a standard with which to compare other stone of the same species.

vering, and loses about $\frac{1}{50}$ part of its weight*.

IN a more intense heat it readily melts, and is, as the chymists express it, fusible per se.

WITH the assistance of an alkali flux it may be vitrified, and forms an opaque glass of a black or blueish colour.

ITS principal component parts are iron in a metallic state, combined chiefly with siliceous and argillaceous earths.

ITS metallic principle may be demonstrated by a very simple experiment.—Let a small fragment of basalt, in its natural state, be brought into contact, or very near to a good magnetical needle, and it may be made to detain the needle at a considerable distance from its meridian. Let this fragment be

* This loss probably arises from water expelled by the heat. For in the course of twenty-four hours after, it will have nearly recovered its former weight, particularly if it be moistened.

touched by a magnet, and it will acquire a pretty strong polarity, capable of attracting or repelling the needle at the distance of an inch or more. From hence it is proved to contain iron in a metallic state, because the calx of that metal is incapable of producing any magnetical phænomena whatever.

To determine the quantity and quality of each constituent part, requires a very slow and laborious operation, which would be almost equally tedious in the description. I shall therefore just mention the results from the experiments of that able chymist, Sir Torbern Bergman, whose authority you will not readily question :

Basaltes 100 parts.

Contains Silicious earth 50 parts.

Argillaceous earth 15

Calcareous earth 8

Magnesia 2

Iron 25

100

FROM

FROM these elements we shall easily be enabled to account for several of its properties.

HENCE it comes to pass that its specific gravity is so considerable, exceeding that of many stones which, when polished, appear much more compact, the quantity of phlogisticated iron easily making compensation.

WE see also why it answers so well for a touchstone, the hardness of its iron particles easily rubbing and fretting off the parts of any softer metal which may be applied to it, and its black ground serving to display these to greater advantage.

HENCE too arises its fusibility without addition ; for though flint, clay, and calcarious earth are separately refractory, in any degree of artificial heat, yet when mixed together they are readily fusible, and still more easily when united with phlogisticated iron.

FROM

FROM the metallic state of its iron element we are enabled to infer, a priori, that the columns of the Giant's Causeway are all natural magnets, whose lower extremity is their north pole, and the upper extremity their south pole. For having stood during many ages in a perpendicular position they must have acquired that polarity which is peculiar to all iron substances, in a similar situation; and like natural magnets, every fragment, when broken, will have its north and south pole. And this I have found true by experience; each pillar of the Giant's Causeway, and each fragment of a pillar, which I applied near to the needle, having its attractive and repellent point.

HENCE likewise it follows that the great capes in the neighbourhood of the Causeway, must possess a similar property; and accordingly, in the semicircular bays of Bengore-head, I have often found the compass very much deranged from its meridian.

THE magnetism of these capes may perhaps be an object of some curiosity ; it might be well worth enquiring how far such masses of phlogisticated iron, within the earth, may produce those sudden and unaccountable deflexions of the needle, which are always inconvenient, sometimes so dangerous to seamen : And whether that still more mysterious and inexplicable phænomenon of the annual variation, may not arise from the gain or loss of the principle of metalliety, which in the slow and regular course of nature may possibly take place, by the various action of heat and moisture.

WE have proof sufficient, on a diminutive scale, that iron may by variety of artificial means, lose or gain that principle on which alone its magnetical property depends ; and the decomposition of the basaltes enables us to affirm, with reasonable certainty, that such changes do actually take place in nature, and that the magnetical phænomena of the promontory of Bengore for instance, must now be different from what it was some ages ago,
or

or from what it will be some ages hence : It may, therefore, deserve consideration, how far this analogy could be pursued with respect to the whole mass of the earth ; particularly as we have evidence of the existence of a natural agent abundantly adequate to this effect, I mean subterranean fire, whose extensive dominion is indisputably proved by those numerous volcanos that have been discovered in so many distant parts of the world, and whose sources must lie at very considerable depths below the surface of the earth, if we may argue from the vast quantity of different substances which they have vomited forth in their various eruptions.

FROM a knowledge of these elementary parts of the basalt, we are furnished with an analogy tending to throw some light on the regularity of its form. One of its principles is found to be silicious earth, and we have very numerous proofs that this substance does, in other instances which come within our observation, frequently affect a regular figure ; variable however under various circumstances.

Thus,

Thus, rock crystal, which is a very pure flinty earth, is commonly disposed in the form of hexagonal prisms, the denomination of fides which chiefly prevails among our basaltic pillars—Thus, variety of crystallizations are found to take place in the metal of glass-houses, where the furnace has been suffered to cool gradually.

IRON is another of the principles which enter into the basalt; and this metal is found to crystallize in regular figures, when all fit circumstances concur to permit the due arrangement of its parts. This is sometimes discoverable in the ores of that metal, and may be observed to take place imperfectly even in our founderies, in what is commonly called the grain of cast iron, generally presenting to view a striated appearance: But in cases where the pains and ingenuity of the chymist has been exerted to exhibit this phenomenon more decisively, very regular cubical figures have been produced, clearly ascertaining the existence of this tendency toward a peculiar disposition of its parts.

IN truth, the particles of every substance in nature, appear to possess private laws and affinities, whereby they proceed to unite, and to arrange themselves in regular forms, when all things necessary combine to assist this tendency ; that is, when by any means whatever, the particles are removed to a sufficient distance, and afterward suffered to approach slowly and regularly according to their various laws of action.

THUS it appears to be in the case of saline substances, which have been held in solution in a watery medium ; for if by the uniform evaporation of the fluid, or any other slow and regular cause whatever, time and space be allowed in which the dissolved particles may exert, without disturbance, their private laws of affinity, these particles will be found to affect an arrangement peculiar to that species of body to which they belong. Thus again, all bodies which have been dissolved by the medium of heat, when suffered to cool equably, and without the rapid afflux of fresh portions of air, do universally exhibit a
peculiar

peculiar disposition of parts ; of which instances enough occur in every species of metal, in sulphurs, in glass, and in short in all substances capable of a perfect fusion.

SINCE therefore we have sufficient evidence, in such instances as come within the reach of human powers and observation, that the elementary parts of the basaltes do affect a specific form of crystallization, and that this form is always more and more perfect, in proportion as our experiments are made with greater regularity, and on a larger scale ; it may not appear unreasonable to pursue the same analogy in the extensive operations of nature, where those laws, which are but imperfectly exerted in our diminutive experiments, may act with full and undisturbed vigour, capable of producing the beautiful symmetry and arrangement of a Giant's Causeway. And though crystals have probably never been produced from any simple substance, precisely answering to the articulated basalt pillars ; yet no very important objection can be derived from hence, since it is well known

known that elements which separately form specific crystals, may when united, constitute by their compound laws, bodies different from either figure. Thus melted glass through which scoriæ of iron had been accidentally mixed was found to affect a columnar shape*.

THESE are the chief matters worthy notice, which have come under my own immediate observation with respect to the perfect stone of the Giant's Causeway. I shall next mention some of the leading varieties of its different species.

FIRST. With respect to form and magnitude.—The pillars of the Causeway are small, not very much exceeding one foot in breadth, and thirty in length; sharply defined, neat in their articulation, with convex or concave terminations to each joint. In many of the capes and hills they are of a larger size, more

* Vide Ker's Observations on the Crystallization of Glass.—*Phil. Transf.* vol. 65.

imperfect and irregular in their figure and articulation, having often flat terminations to their joints. At Fairhead they are of a gigantic magnitude, sometimes exceeding five feet in breadth, and a hundred in length; oftentimes apparently destitute of joints altogether. Through many parts of the country this species of stone is entirely rude and unformed, separating in loose blocks, in which state it resembles the stone known in Sweden by the name of Trappe.

SECONDLY. With respect to situation.—The pillars at the Giant's Causeway stand on the level of the beach; from whence they may be traced through all degrees of elevation, to the summit of the highest grounds in the neighbourhood; as at the old fort of Dunmull; and on the top of Croaghmore, six hundred feet at least above the level of the sea.

THIRDLY. With respect to disposition and arrangement.—At the Causeway, and in most other places, they stand perpendicular to the horizon;

horizon; in some of the capes, and particularly near Ushet harbour in the Isle of Raghery, they lie in an oblique position; at Doon point, in the same island, and along the Ballintoy shore, they form variety of regular curves.

THE little point of Doon is indeed extremely curious, containing at once perpendicular, horizontal and bending pillars. Its base resembles a mole composed of erect columns like those of the Giant's Causeway; over the extremity of this mass others appear in a bending form, as if they had slid over in a state of softness, capable of accommodating themselves to the course of their descent, and thus assuming the figure of various curves in consequence of the action of gravity; over all, several pillars are disposed in an horizontal position, such as would accord with an hypothesis of their having just reached the brink of the descent where they were suddenly arrested, and became rigid, lying along with their extremities pointing out toward the sea.

FOURTHLY.

FOURTHLY. With respect to colour and grain.—The Giant's Causeway stone is black, close, and uniform; its varieties of colour are blue, reddish, grey; and of grain, all that can be supposed from extreme fineness, to the coarse granulated appearance of a stone which resembles imperfect granite, abounding in crystals of schorl, chiefly black, though sometimes of various colours.

FIFTHLY. With respect to texture.—We must observe, that though the Giant's Causeway stone be in general compact and homogeneous, yet it is remarkable that the upper joint of each pillar, where it can with certainty be ascertained, is always rudely formed and cellular*: The gross pillars also, in the capes and mountains, frequently abound in these air-holes through all their parts, which sometimes contain fine clay, and other apparently foreign bodies: And the irregular basaltes, beginning where the pillars cease, or lying over them, is in general extremely honey-combed, containing in its cells crystals

* Vide pillars at the Museum of Trin. Coll. Dub.

of zeolyte, little morsels of fine brown clay, sometimes very pure steatite, and in a few instances bits of agate.

THE fossils attendant on the basalt, are First—Extensive layers of red ochre, varying in all degrees from a dull ferruginous colour, to a bright red, answering well for coarse paint.

SECONDLY—Veins of iron ore, sometimes very rich, commonly of a brown or reddish cast, at other times of a changeable blue colour.

THIRDLY—Steatites, generally of a greenish soapy appearance, more rarely of a pure white—it raises an imperfect saponaceous froth when agitated with water.

FOURTHLY—Zeolyte, of a bright and purest white colour; in masses varying in weight from a grain to a pound; generally disposed in cavities of the cellular basalt; often affecting a crystallization, in which the fibres radiate out from one center, in some instances resembling a beautiful spangled appearance of
thistle-

thistle-down. The most remarkable property of this fossil is, that it forms a gelatinous mixture in the course of a few hours with any of the mineral acids, most readily with spirit of nitre *.

FIFTHLY—Peperino stone, a friable matrix of indurated clay and iron, studded with little morsels of zeolyte, and other substances. It is often of reddish burnt colour, corresponding accurately with the peperino stone of Iceland.

* Zeolyte is said by the chymists to be composed of argillaceous, siliceous and calcarious earths, united in certain proportions to water (vide Kirwan's Mineralogy, page 65). Now that these elements may possibly be found in it I do not deny, but that its singular properties can be accounted for from this union alone seems not likely. In truth, chymical tests depending only on affinities already known, cannot always discover the presence of that element on which the chief phænomena of bodies may often depend. A chymical analysis can then only be esteemed perfectly decisive when it is supported by a fair synthetical proof, demonstrating that the component parts discovered by the analysis may be so united as to form a substance possessed of all the properties of the original.

SIXTHLY—Pumice-stone, of a deep black colour, containing iron not entirely dephlogisticated, but still capable of acting on the needle; sometimes found on the shore of the island of Raghery.

THE following fossils seem to have existed in their present form, independent of, and perhaps antecedent to, the basalt.

FIRST. Chalky limestone.—The whole country appears to have been originally formed of this substance, to the height of several hundred feet above the present level of the sea. It lies in beds nearly parallel to the horizon, and contains some scarce petrefactions, particularly belemnites—more rarely *asteriæ*.

SECONDLY. Flints.—These are disposed in great abundance, and of various shapes, through the chalky limestone; sometimes, however, they are found loose through the ground: at other times they may be discovered among the basalt*: but in all

* For instance, under Dunluce Castle.

these instances the limestone appears to be their proper matrix, from whence they have been only accidentally dispersed; for the vegetable mold (in which they are never found, except near the limestone) most commonly abounds in calcarious earth, as if it had been principally formed by the decomposition of that substance, while the harder texture of the flints, suffering little change, were scattered in their original state irregularly through it. As for the basalt, it only contains them at, or very near to the place of contact with the inferior mass of calcarious stone, bits of which still continue to adhere to the flints in many parts. The substance of the flints too seems to have undergone some change in this situation, their transparency, hardness and colour being often considerably altered.

THIRDLY. Sandstone.—A great mass of this forms the eastern side of Ballycastle bay, and in one part the basalt pillars of Fairhead rest on it.

FOURTHLY. Pit coal.—It lies in beds between the layers of sandstone at Ballycastle,
and

and appears to continue under the sea to the island of Raghery.

FIFTHLY. Martial vitriol.—This is formed among the coal pits, by the union of the sulphureous acid of the coals with a stratum of iron.

SIXTHLY. A very singular range of calcarious phosphoric rocks.—These lie on the shore of the isle of Raghery, nearly where the vein of Ballycastle coals might be supposed to reach. Close to the shore it resembles a hard white limestone, of a blueish cast; a little further inland it becomes softer, and whiter; by and by it assumes the appearance of a calcarious sand stone; in each of which states it produces a vivid yellowish light when sprinkled on coals, or a hot iron. It does not emit a sulphureous smell in burning, nor does it discolour vitriolic acid in solution*.

* Specimens of all these fossils may be seen in the Museum of T. C. D. under the description of Irish Fossils, County of Antrim.

I HAVE here given you a summary of the principal varieties of the basalt, and its attendant fossils; perhaps you will say that my brevity does not help to make me intelligible, but to this I must answer, first, that if fossils cannot be ascertained by a few general characteristics, a more laboured description of minute circumstances will do little else than perplex any person who is not a very good mineralogist, in which case we have no resource but in actual observation. And, secondly, that such circumstances as I have here mentioned, will probably afford a foundation broad enough on which to build any analogical reasoning that may be derived immediately from the nature of the substances themselves.

As I should be sorry to have given you the trouble of reading this letter, only for the unprofitable labour of learning uncommon names, which would certainly be the case did this account terminate the subject; I shall, in my next letter, candidly apply such arguments as can be derived from the nature and properties of these fossils, to explain the
volcanic

volcanic theory of the production of the basaltic ; at the same time, however, I hope to be able to state, with equal honesty, such objections as seem most substantially to militate against this favourite hypothesis—leaving it to your own excellent judgment to decide on a subject, where, as Sir Roger de Coverly would observe, “ much might be said on “ both sides.”

LETTER

L E T T E R X.

Portrush, August 31, 1784.

DEAR SIR,

THERE are few things that can affect a contemplative mind with more surprise, than the numerous and signal changes which appear to have taken place, in the form and arrangement of our earth, at some very distant age. It is a subject which has at all times engaged the attention of mankind, and certainly constitutes the most interesting department of natural history.

FROM the frequent and unequivocal vestiges of marine productions, which are found
in

in the midst of our most extensive continents, and on the summit of several of the loftiest mountains, some philosophers have been induced to attribute the formation of the present habitable world, to the violent and tumultuary fury of the ocean, agitated by some uncommon cause* : Whilst others† have thought, that the gradual, but unceasing efforts of its heaving billows, were abundantly adequate to account for these appearances on more common principles.

BUT variety of natural phænomena occur to an attentive observer, which are deemed incapable of being reasonably explained by these hypotheses ; whether we regard the general features and elevation of many of our continents, or the nature and situation of the fossils which they contain.

HENCE it has come to pass, that a new and more powerful principle, esteemed entirely

* Burnet, Whiston, Woodward, &c.

† Buffon, &c.

equal to those effects, has been adopted, and many of the most surprising phænomena of nature are held to be explicable by the potent agency of subterranean fire.

To this latter cause the formation of our pillars of basalt has been attributed, with some appearance of probability; and though much has been said on this subject with vagueness and indecision, concerning the manner of their production, yet the principal facts that have been adduced in favour of the general opinion, are well worthy of attention, and open to view a very novel and important object of enquiry.

THE first person who took a decided part in favour of the volcanic theory of the basalt, was Monsieur Desmarest, a French gentleman, whose Memoire on that subject may be seen in the publication of the Royal Academy of Sciences for the year 1771. Mr. Desmarest made a tour through the county of Auvergne, one of the southern provinces of France in the neighbourhood of the Rhone, where

where he discovered many piles of basalt, with more variations of magnitude, figure, and arrangement, than was at that time known about the Giant's Causeway in Ireland. By his means a geographical survey was made of this part of France, and a map delineated, in which the direction of the mountains, and the situation of its basalt, were supposed to be accurately projected.

FROM this map, and his own personal observations of the nature of the soil, and the general species of its fossils, he conceived that this country had once been ravaged by subterranean fire, of whose wasteful dominion undeniable vestiges still remained; and that the bold inequalities of its surface, its hills and vallies, were formed by vast heaps of scorix, and different melted substances, which had issued from its volcanic mountains, spreading themselves in every direction from these flaming centers.

HE imagined also, that many of these melted torrents might be traced through
their

their whole extent, from the side of the great volcano which gave them birth in the mountains of D'or, to their remotest extremities, where they terminated in banks of prismatical basalt. From all these circumstances he concluded, that the basaltic columns were formed by the gradual refrigeration of a mass of fluid lava, during its flow and retarded progress over the subjacent soil, and that most of its varieties of shape and situation, might naturally be attributed to the different interruptions of its course, or to the alterations introduced by the successive ravages of volcanic fire *.

AFTER

* A mesure qu'on parcourt ces Cantons, en faisant la recherche & l'énumération des masses prismatiques, qu'on étudie les courants, sur tout vers leur extrémités, qu'on suit leur marche depuis le centre des éruptions, leur enchaînement & leur distribution à la superficie des plaines hautes qui séparent les vallons, qu'on examine les différentes espèces des pierres dont ils sont composés, on reconnoît à chaque pas que ce sont des hors d'œuvres établis sur le sol naturel. On distingue les produits du feu des substances intactes, & l'on apprécie en même temps les transports

AFTER Mr. Desmarest many writers both foreign and domestic pursued this interesting subject with great ardor. Among the English authors we are principally indebted to the labours of Sir William Hamilton, whose valuable collection of facts relating to those places which are at this day the seat of living volcanos, afford the surest rules of judgment concerning such countries as do yet bear strong marks of a volcanized appearance, without any direct evidence of the existence of subterranean fire.

BUT the person to whom we owe the most ample compilation of materials, immediately relating to the basaltés, is Monsieur Faujas de St. Fond, who has lately published a voluminous work on the extinct volcanos of Viverrais and Velay, counties adjoining to Auvergne, which had before been described by Mr. Desmarest. In this work

ports immenses des matieres fondues, dont les prismes font toujours partie.—*Desmarest sur l'origine & la nature du Basalt, see Memoires of the French Academy for the Year 1771.*

the

the author has given a particular memoir on the bafaltes, to which he has annexed descriptions, and engravings of the most remarkable banks and mountains of basaltic columns in these two countries. But what renders his work still more valuable, are the minute and accurate accounts which it contains of the attendant fossils, particularly the zeolyte, fchorl, and puzzolane earth; because we are from thence enabled to decide whether these substances be universally connected with the bafaltes, or are only the accidental attendants of it in a few particular countries; and where such fossils are found together, we have it in our power to estimate fairly the force of those arguments derived from their nature and connexion in any one country, by considering candidly, how far they should weigh with us in those instances which come immediately under our own particular observation.

IN my last letter I enumerated the chief varieties of the bafaltes and its attendant fossils, as they occur in the northern parts of
Ireland;

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Ireland; and I shall now briefly state to you such arguments as may be derived from them, in proof of the ancient existence of subterranean fire in their neighbourhood.

FIRST. The basalt itself is esteemed to be nothing else than lava; and its varieties are attributed entirely to accidental circumstances attending its course, or the manner of its cooling.—In support of which opinion it is affirmed that the basalt agrees almost accurately with lava in its elementary principles *, in its grain, in

* This will appear pretty evident from stating the products of each substance according to the analysis of that able chymist, Sir Torbern Bergman :

Basalt, 100 parts.

Lava, 100 parts.

	<i>Parts.</i>		<i>Parts.</i>
Contains Siliceous earth	50	Contains Siliceous earth	49
Argillaceous earth	15	Argillaceous earth	35
Calcareous earth	8	Calcareous earth	4
Magnesia	2	Iron	12
Iron	25		—
	—		100
	100		—
	—		

the

the species of the foreign bodies which it includes *, and in all the diversities of its texture †.

SECONDLY. The iron of the basalt is found to be in a metallic state, capable of acting on the magnetical needle. The same is true of the iron contained in the compact lava.

THIRDLY. The basalt possesses the remarkable property of being fusible per se; this property is also common to the lava and most volcanic substances.

FOURTHLY. The basalt is a foreign substance, superinduced on the original limestone soil of the country, in a state of softness ca-

* Bits of limestone, flints, schorl, crystals of various colours, morsels of pure clay, &c. are common to the basalt and to lava.

† All the varieties of texture which take place in lava, from the compact close-grained kind to the spongy lava, may also be traced among the basalts.

pable of allowing the flints to penetrate considerably within its lower surface.—It is hardly necessary to add, that the lava is an extraneous mass, overspreading the adjoining soil in a fluid state; that it is often borne on a limestone base; or that flints and other hard matters do frequently penetrate into its substance. In short, the circumstances of agreement are so numerous, and so clear, as to create a very reasonable presumption that they are one and the same species of substance.

BUT the evidence derived from the nature and properties of the attendant fossils, seems also to contribute largely in support of this opinion.

THOSE extensive beds of red ochre, which abound among our basaltes, are supposed to be an iron earth reduced to this state of a calx by the powerful action of heat; for such a change may be produced on iron in our common furnaces, provided there be a sufficient afflux of fresh air; and the basaltes
itself

itself in such circumstances is easily reducible to an impure ochre, exactly similar to that found at Bengore. This phænomenon is also observed to take place more or less in the present living volcanos, particularly within their craters, and is therefore held to afford a presumptive argument of the action of fire in the neighbourhood of the basaltés.

I REMARKED to you the frequent bits of zeolyte which abound in the county of Antrim, and these, though not the immediate product (as far I know) of any living volcano, are yet thought to countenance the general system, because zeolyte is found in countries where subterranean fire is still visible, and where there is great reason to apprehend that the whole soil has been ravaged by that principle. Thus it abounds in Iceland, where the flames of Hecla yet continue to blaze * ; and in the Isle of Bourbon, which is said to bear undeniable marks

* Vide Van Troil's Letters on Iceland.

of a volcanic character*; this substance is therefore supposed to arise from the decomposition of the volcanic products, in places whose fires have been long since extinct.

CRYSTALS of schorl appear in great plenty among many kinds of our basalt, and these, though not absolutely limited to volcanic countries, yet being found in great abundance among the Italian† lavas, in circumstances exactly corresponding to our's, are thought to supply a good probable argument in the present instance.

THE substance which I mentioned under the name of the peperino stone, is believed to be the undoubted offspring of fire; it has frequently the burnt appearance, and spongy texture of many of the volcanic products, and agrees accurately with the peperino of Iceland and Bourbon, islands which still contain burning mountains.

* Vide Messrs. Desmarest, Faujas de St. Fond, Raspe, &c.

† Vide Ferber's Letters on Italy.

PUZZOLANE earth is not immediately found in that state in Ireland, but it is discovered among the basaltes of France, and there is very little doubt that our basaltes, if pulverized, would agree with it in every respect; that is, it would produce a fine, sharp powder, containing the same elementary parts, and most probably answering all its valuable uses as a cement*. Puzzolane earth is found in the Canary Islands, which are esteemed to have other characteristics of the effects of fire; it is met in abundance through all the volcanized parts of Italy; it is never discovered except in places which have other strong marks of the ravages of fire.

THE discovery of this earth is therefore thought to add great weight to the many

* A few experiments on this subject might perhaps be worth the attention of the gentlemen concerned in carrying on the inland navigation of Ireland; and there is the more reason for hope of success in this enquiry, as the Swedes have already applied their pulverized Trappe (much resembling our coarse basaltes) as a good substitute for the puzzolane formerly brought at great expence from Italy and the Canary Islands.

other

other proofs which have been mentioned in favour of the general system.

PUMICE-STONE is a substance so generally acknowledged to be the product of fire, that I need not be at any trouble to enforce it; indeed it bears the character of a cinder so obviously in its exterior appearance, that one must be convinced at first view of its original. —This fossil is sometimes found on the shore of the island of Raghery, among the rounded stones on the beach of the sea*, and being supposed an unequivocal test of the action of fire, is imagined to compleat all that could be desired in this kind of reasoning.

SUCH are the internal arguments in support of the volcanic origin of the basaltés,

* Pumice-stone occurs so rarely that I have been often induced to doubt whether it might not be a foreign substance accidentally driven here by the waves from Iceland, or some other volcanic country. However, on trial, it is found too heavy to have floated hither, its iron not being entirely dephlogisticated, as is evident from its deep black colour, and a small degree of magnetism which it still possesses.

immediately

immediately derived from the nature and properties of that substance and its attendant fossils, compared with other substances which are the certain products of fire; and it must be confessed there appears throughout such a remarkable coincidence of circumstances, as raises a strong presumption in favour of the opinion that they have been produced by similar causes; but there still remains other external proofs, which, when added to the former, are supposed to form a demonstration almost as perfect as the nature of such analogical reasoning will allow.

IN the beginning of this letter I mentioned that Messrs. Desmarest and Faujas de St. Fond had described the basaltic provinces of France, as containing mountains, whose exterior appearance was such, that they readily pronounced them to be extinct volcanos. One of these, on the banks of the river Ardèche, called the Montagne de la Coupe, seems to exhibit the proofs of its origin in characters peculiarly clear and distinct. It is
of

of a conical form, exactly corresponding in shape with the present living volcanic mountains, and like them it contains a large crater nine hundred and fifty feet in diameter, and six hundred feet in depth *. The substances that have been discovered through all its parts, particularly in a deep ravine formed on one side by torrents, bear a strong resemblance to many of the Vesuvian products. In fine, the volcanic features of this mountain are so strongly marked, that an accurate account of it would afford no very unsuitable description of Vesuvius itself during the intervals of its eruptions. Now the Montagne de la Coupe contains at its base abundance of basaltic pillars, which have been exposed to view on one side by the impetuous torrents of this mountainous country, particularly of the river Ardesche, whose banks are formed of columnar basaltes. And thus are the two characters of a basaltic and vol-

* Vide Monf. Faujas de St. Fond—Sur les eteint Volcans, &c.

canic mountain esteemed to be decisively united in the Montagne de la Coupe*.

THERE are three living volcanos at present known, within whose neighbourhood the basaltés, and most species of its usual attendant, fossils, have been observed. The first is situated in the island of Bourbon, off the southern coast of Africa†; the second is *Ætna* ‡, in the island of Sicily; and the third is *Hecla*, in the island of Iceland||. To which it may be added, that the basaltés is found in the volcanized parts of Italy, as at

* I have been the more particular in mentioning this mountain, because my information concerning it has been confirmed by the account of my intelligent friend, Doctor Perceval of Dublin, whose accurate observations and excellent judgment can only be exceeded by the uncommon candour of his mind.

† Vide Messrs. Desmarest, Faujas de St. Fond, Raspe, &c.

‡ The island of Castel-a-mere, near Catana, off the coast of Sicily, is entirely basaltic.—*Vide Sir William Hamilton's Campi Phlegræi.*

|| Vide Von Troil's Letters on Iceland.

Bolzena,

Bolzena *, and other places ; though not (as far as I have been informed) any where immediately contiguous to Vefuvius. Thus, (say the naturalists) do the arguments derived from the situation of this species of fossil, with respect to mountains which yet continue to burn, coincide with those other clear and satisfactory proofs, which were drawn immediately from its nature and properties, in proof of its volcanic origin.

IN addition to what has been here stated, I shall mention another plausible argument in support of the opinion, deduced in some measure a priori.

IT is well ascertained by experience, that there are vast beds of pyrites dispersed through the interior parts of the earth at all depths ; and it is a certain fact, that this compound substance may, by the accidental affusion of a due quantity of water, become hot, and at length burn with great fury. This, there-

* Vide Sir William Hamilton's *Campi Phlegræi*, Ferber's Letters, &c.

fore, is one principle to which we may, with the strongest probability, attribute the origin of subterranean fire, more especially as the present living volcanos do actually pour forth in abundance all the component parts of the pyrites, the chief of which are sulphur, iron, and clay. Now, among the superinduced substances of the county of Antrim (and I believe the same may be said of every other basaltic country) it is certain that the quantity of iron and clay, diffused through almost every species of fossil, amounts to more than one half of the whole materials, so that two of the principal elements of the pyrites are still found here, reduced in many instances to a state of slag or scoria; and the third principle, namely the sulphur, cannot in the nature of things be expected to remain, because sulphur does in great measure perish during the act of inflammation; and what might perchance escape or be sublimed would no doubt have long since perished by decomposition, in consequence of being exposed to the air.

THUS

THUS in fact every part of the pyrites which could reasonably be expected to survive, does at this day actually exist, in form extremely similar to the products of Ætna, Vesuvius, and Hecla, the three most celebrated volcanos of Europe.

LETTER

L E T T E R XI.

Portrush, September 3, 1784.

DEAR SIR,

NOTWITHSTANDING the numerous, and specious arguments, which are urged in defence of the volcanic theory of the basalt, yet many difficulties and objections have been raised against it by men of excellent understanding; some of these are of considerable force, and as I do not wish to dictate any opinion to you, but rather, modestly to offer what information has come in my way on the subject, I shall candidly state those objections, together with the most reasonable answers. .

It

IT is said, that this theory does rashly attribute some of the most regular and beautiful phænomena of nature to one of the most tumultuary and irregular causes that can be imagined ; ascribing the exquisite arrangement of a Giant's Causeway, which almost emulates the laboured works of design, to the blind fury of a burning volcano.

THIS objection, which is pretty strong in itself, has certainly received very considerable support from the various unsuccessful attempts that have been made to explain the manner in which the pillars of basalt were produced : One person * wildly attributing their formation to the refrigeration of a current of lava, suddenly plunged into the ocean : Another obscurely hinting that some occult quality in the sea salt might have had its share in the business : A third † supposing, contrary to experience, that the melted mass of lava might in its liquid state have been capa-

* Mr. Raspe.

† Mr. Kirwan.

ble of a considerable diffusion or solution in water, by which means the particles had an opportunity of arranging themselves in regular crystallizations: A fourth *, conceiving that the basalt was originally a bed of iron, and other substances, gradually moistened, and softened in the steams of water heated by subterranean fire, and afterward assuming its regular figure during the time of drying and hardening.

It is pretty plain, that none of these indefinite explanations can at all satisfy a thinking mind, and as an unfortunate argument generally tends to encrease the apparent weakness of a cause, in defence of which it is brought forward, it has hence come to pass, that many persons, of good sense, have held the whole volcanic system to be extremely fallacious.

In truth, there seems to be but one operation of nature, which affords any rational principle of analogy, by which we can attempt

* Bergman.

tempt to explain the formation of the basaltic pillars. It is certain that the particles of most bodies, when removed from each other to a proper distance, and suffered to approach gradually, assume a peculiar form of arrangement, as if the parts of each species of matter did, independent of their general properties of cohesion and gravity, possess also private laws and affinities tending to produce these specific forms. However, let the cause be what it may, the fact at least is sufficiently certain: and it does not appear to be a matter of any importance by what medium the particles are disunited, provided only, that a sufficient separation, and a gradual approximation, be allowed to take place.

THUS, whether bodies be dissolved by fire, or by a watery medium, the phenomena of crystallization is equally observable, when proper art has been applied to render its effects visible.

I MENTIONED, in a former letter, that the basalt was capable of a very perfect fusion,
and

and that two of its elementary parts were such, as, by experience, we know to possess the property of crystallization by fusion, both in their separate and combined states. Since therefore the basaltes, and its attendant fossils, bear strong marks of the effects of fire, it does not seem unlikely that its pillars may have been formed by a process exactly analogous to what is commonly denominated crystallization by fusion.

THE only apparent specific difference between the basaltic crystals, and those which are produced in our diminutive laboratories, seems to be, in the complete disunion of the pillars, and in the articulated form which they sometimes exhibit. But this will not appear to be a matter of any importance, when we reflect, that in natural operations of the same kind, but differing in magnitude, the same proportions are commonly observed between the different parts: Thus, the same ratio which the diameter of a basaltic pillar bears to the diameter of one of our diminutive crystallizations, will the interval be-

M tween

tween the pillars of basalt bear, to the interval between the parts of our crystals ; and whoever will take the trouble to calculate this distance, will find it so very small, as easily to admit the different surfaces within the limits of cohesion ; so that no separability of our crystals into joints can possibly take place, from their smallness, though they often bear marks which might lead one to imagine them capable of disunion.

IF this reasoning be allowed to have weight, the objection derived from the irregularity and confusion of a volcanic cause will not appear unanswerable. For though, during the moments of an eruption, nothing but a wasteful scene of tumult and disorder be presented to our view, yet, when the fury of those flames, which have been struggling for a passage, has abated, every thing then returns to its original state of rest, and those various melted substances, which but just before were in the wildest state of chaos, will now subside, and cool with a degree of regularity utterly unattainable in our laboratories,

and

and such as may easily be conceived capable of producing all the beauty and symmetry of a Giant's Causeway.

A SECOND objection arises from hence, that the currents of lava which have issued from *Ætna* and *Vesuvius*, within the memory of man, have never been known to exhibit this regularity of arrangement. It is therefore said that experience does abundantly prove the fallacy of the volcanic hypothesis.

IN reply to this we are told, that it is not in the erupted torrents of these volcanos we are to look for the phænomena of crystallization, but in the interior parts of the mountains themselves, and under the surface of the earth, where the metallic particles of the lava have not been dephlogisticated by the access of fresh air, and where perfect rest, and the most gradual diminution of temperature, have permitted the parts of the melted mass to exert their proper laws of arrangement, so as to assume the form of columnar lava: That we must wait, until those volcanic

mountains which at present burn with so much fury, shall have compleated the period of their existence ; until the immense vaults, which now lie within their bowels, no longer able to support the incumbent weight, shall fall in, and disclose to view the wonders of the subterranean world : And then may we expect to behold all the varieties of crystallization, such as must needs take place in these vast laboratories of nature ; then may we hope to see banks and causeways of basaltes, and all the bold, and uncommon beauties, which the abrupt promontories of Antrim now exhibit.

It is stated as a third objection, that according to this hypothesis, the basaltes must have been reduced to a perfect state of fluidity, in order to permit the phænomena of crystallization to take place, but, that there is no reason for believing it ever could have been subjected to any intense action of fire, so as to be reduced to a state of thin fusion, because it does not contain air-holes, like the lava, nor possess those marks of vitrification,

cation, which attend a very moderate heat in our laboratories.

THE first part of this objection is certainly ill-founded, though advanced by Wallerius, and other eminent mineralogists. All the basaltcs, which I have ever seen, does, in one part or another of its substance, always exhibit air-holes; and it is remarkable that even the pillars of our Giant's Causeway, which are singularly compact, have their upper joints constantly more or less excavated, so that this part of the argument does rather plead in defence of the volcanic origin of the basaltcs.

WITH respect to the want of all marks of vitrification, we are to consider that substances in fusion are very differently affected, in proportion as they are more or less exposed to the access of fresh air, the presence of this element being absolutely necessary in order to deprive a body of its phlogiston.

THUS,

THUS, metals which may be readily vitrified by exposure to heat, and the free afflux of air, will yet bear the most intense action of fire in close vessels, without being deprived of that principle on which their metalliety depends, and are therefore in this situation incapable of being vitrified. The basaltès may therefore have been subjected to a very great degree of heat, within the bowels of the earth, and yet shew no marks whatever of vitrification, and hence it may be explained, how it comes to pass that the iron principle of the basaltès still retains its phlogiston, acting so sensibly on the magnetical needle.

A FOURTH objection is derived from hence, that in many of the countries where the basaltès most abounds, there are no traces whatever of those bold and decisive features which constitute the distinguishing characteristic of a volcanic mountain ; its lofty pointed form, its unfathomable crater, and many other circumstances that strike the senses very forcibly at *Ætna* and *Vesuvius*.——

The

The basalt, therefore, is affirmed to be a fossil extensively spread over the surface of the earth, and where it is found in the neighbourhood of volcanic mountains, it is said we should suppose these to be accidentally raised on a basaltic soil, rather than to have created it.

It must be confessed that volcanic mountains are not always found to attend the basalt, at least there do not appear any direct vestiges of them in the neighbourhood of the Giant's Causeway in Ireland.

BUT the advocates of the system are not much embarrassed with this difficulty; according to them, the basalt has been formed under the earth itself, and within the bowels of those very mountains, where it could never have been exposed to view, until by length of time, or some violent shock of nature, the incumbent mass must have undergone a very considerable alteration, such as should go near to destroy every exterior volcanic feature. In support of this it may be
observed

observed that the promontories of Antrim do yet bear very evident marks of some violent convulsion which has left them standing in their present abrupt situation; and that the island of Raghery, and some of the western isles of Scotland, do really appear like the surviving fragments of a country, great part of which might have been buried in the ocean. It is further added, that though the exterior volcanic character be in great measure lost in the basaltic countries, yet this negative evidence can be of little avail, since the few instances where the features have been preserved afford a sufficient answer to this objection.

THUS the Montagne de la Coupe in France still rears its pointed top to the Heavens, retains its deep crater, and bears every characteristic of its volcanic origin; and this mountain is observed to stand on a base of basaltic pillars, not disposed in the tumultuary heap into which they must have been thrown by the furious action of a volcanic eruption, tearing up the natural soil of the country,
but

but arranged in all the regularity of a Giant's Causeway, such as might be supposed to result from the crystallization of a bed of melted lava, where rest, and a gradual refrigeration, contributed to render the phænomenon as perfect as possible.

FIFTHLY. It is observed by Monsieur Faujas de St. Fond, that at the foot of the mountain of Mezinc, in the province of Velay, a range of basaltic pillars stands supported on a bed of fossil coal, with a very thin stratum of clay, not more than a few inches thick, interposed; now that this inflammable body of coal should have remained uninflamed, under a mass of melted lava, thirty feet thick, seems highly improbable, and therefore it is evident, say the adversaries of the system, that the basaltes could not have derived its origin from fire.

IN answer to this plain and weighty objection, it is affirmed, that no substance in nature can be consumed by fire without the access of atmospheric air; that fire may be
passed

passed through inflammable air itself, without exciting actual inflammation, unless the atmosphere lend its assistance. Hence it cannot appear strange that a bed of coal might have survived in the neighbourhood of a volcano, and even under a mass of fluid lava, which, by resting on it, would prevent every possible approach of fresh air, so absolutely necessary to its being inflamed. It is certain that coal may be exposed to the violent action of fire, in a close vessel, without being consumed, or even suffering any material alteration, and therefore it is believed that this particular instance ought not to be held of weight sufficient to overturn a system, in support of which so many reasonable and almost certain proofs concur.

SUCH are the difficulties which are thought to embarrass the volcanic theory of the basaltæ. In your excellent judgment I am certain they will bear their just value, founded on an extensive knowledge of nature and her operations. But among the generality of mankind their weight will be exceedingly various.

In

*It is probable that the lava flowed over a
stratum, which subsequently became char-
acterized by the same substance.*

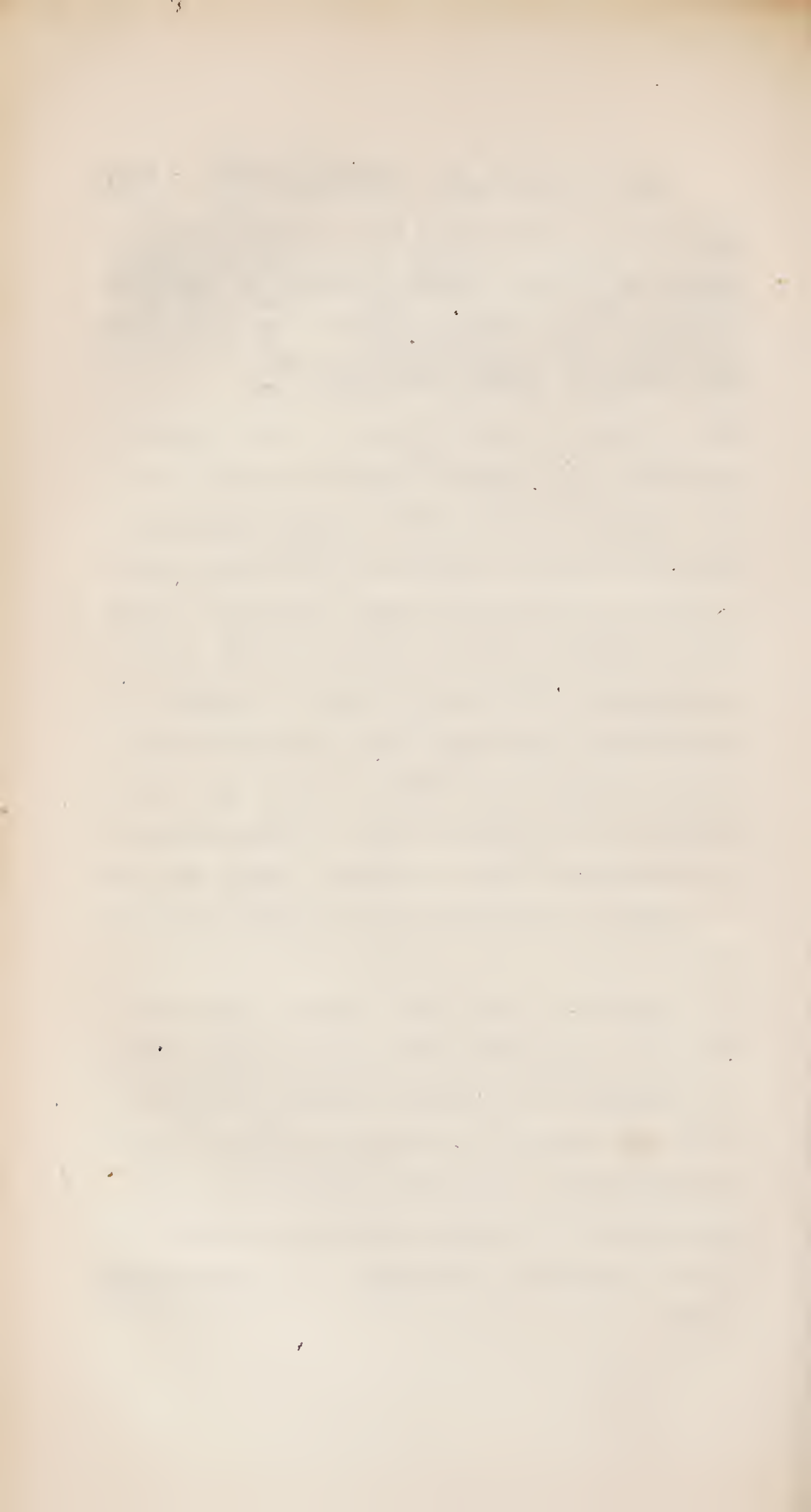
In reasonings concerning natural phænomena, the standard of truth is extremely vague and equivocal. Climate bears here a more powerful influence than can well be imagined; so that it is not uncommon to find an opinion universally adopted by the inhabitants of one country, while those of the neighbouring kingdom shall join as universally to reprobate it.

Thus the Neopolitans, accustomed from their infancy to the wild scenes of horror and desolation which abound in a soil ravaged by volcanic fire, and to see as it were a new world suddenly raised on the ruins of their country, have their warm imaginations filled with the gigantic idea of this powerful principle, which to them appears adequate to the production of every thing that is great and stupendous in nature. How different are the sensations and opinions which prevail in the native of our temperate island! To him the sound of thunder is uncommon, an earthquake is almost a prodigy, and the fury of
subterranean

subterranean fire is utterly unknown. He beholds nature pursue her calm and steady course with an uniformity almost uninterrupted; he views the same objects unchanged for a long series of years; the same rivers to water his grounds, the same mountains supply food for his flocks, the same varied line of coast continues through many successive ages to bound his country, and to set the waves of the foaming ocean at defiance; hence he naturally proceeds to extend his ideas of regularity and stability over the whole world, and stands utterly uninfluenced by those arguments of change in the earth, which to the inhabitant of a warmer climate appear absolutely decisive.

IN this manner are the prevailing opinions, even among the philosophers of most countries, generally founded on partial analogies; and it requires a vigorous mind, as well as an extensive and clear understanding, to prevent our being misled by the specious arguments and dangerous conclusions which
have

have been derived from such deceitful sources, many of them plainly tending to multiply false opinions, and to subvert the only true principles of religion and morality.



L E T T E R XII.

Portrush, September 10, 1784.

DEAR SIR,

IF the volcanic theory of the basaltés be well founded, and no doubt many of the arguments in favour of it are extremely plausible, a scene of horror is presented to our view, which must surely fill us with astonishment; since on this system it will be found, that there is hardly a country on the face of our globe which has not at some time or other been wasted by the fury of subterranean fire.

IF, again, those apparent vestiges of marine productions, which are observed indiscriminately

nately scattered through the earth, at all depths below its surface, and on the summits of its highest mountains, be esteemed sufficient proofs of the presence of the ocean in those places, a scene, no less wild and uncommon than the former, rises before our imagination ; in which the products of the equator and the poles appear to be jumbled together, in a manner incapable of being explained by any of the known analogies of nature.

FROM observations such as these, where in truth every thing is inexplicable, many of the modern philosophers, chiefly indeed of the French nation, have become warm admirers of the old brute atoms of Epicurus, or the mysterious plastic principle of the stoics, forming to themselves systems of nature, in which an intelligent cause seems to be of all others the least necessary ; systems in which blind destiny alone is the active spring of life and motion.

THUS

THUS are the sources of religion and morality effectually cut off at one blow; and mankind deprived of those present blessings, and that delightful hope of future happiness, which they fondly imagined to be rightly founded on their natural instincts, and supported by the fairest deductions of reason.

IT is the business of natural history to collect, as extensively as possible, all the phænomena of nature, to compare such of them as bear any reasonable similitude, and from their general analogies to derive conclusions which may benefit our fellow-creatures, either as discoveries useful in common life, or as speculative truths suited to improve and enlarge the understanding. In this point of view it is a science which merits the honourable praise of mankind; and is certainly inferior to none in the copious sources of delight and improvement which it may afford to a rational mind.

SURELY it is most unaccountable, that a study which in this character appears so lovely

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and engaging, should nevertheless have been pursued upon such perverse principles, and with such misguided views, as to lead to consequences equally false in their own nature, and ruinous to the welfare of any society where they may become universally prevalent.

I HAVE been accidentally led to make a few reflections on this subject, by the perusal of some foreign writers on natural history, who have unfortunately applied the proofs of those inexplicable changes which may possibly have taken place in the earth, and indeed all their negative knowledge of nature, for the purpose of disproving the existence of its admirable author; as if arguments derived from the depths of human ignorance could, with any reason, be esteemed capable of overturning such positive truths as the faculties of mankind are entirely adequate to apprehend.

WHEN men chuse to build their opinions on things which they do not rightly understand,

stand, rather than on truths which come clearly within their comprehension, it can hardly happen that they will not run into very gross mistakes ; because, as the number of errors on any subject is plainly without limits, the chance is little less than infinite, that such reasoners will fall into the unfathomable abyfs of falsehood.

SUCH has been the fate of the author of a French work, *Sur la Nature*, and indeed of every follower of that pernicious school of modern philosophy, which, rejecting all consideration of final causes, and despising those simple and obvious analogies that lead to the most useful and satisfactory truths, has chosen rather to pursue others, which neither its disciples, nor the rest of mankind, are in any respect suited to investigate*.

* “ Il est au dessous de Dieu d’agir pour une fin.”—*Vide Des Cartes Philosoph.*—*Maupertuis Essai de Cosmologie.*—*Buffon Theorie de la Terre.*—*Robinet Sur la Nature, &c. &c.*

PERHAPS an example may serve to render me more intelligible, and to point out the general fallacy of this unhappy species of reasoning.

THERE can be no doubt that the telescope, with all its present improvements, is the result of a most happy application of uncommon skill and ingenuity, contriving and combining all the various parts and movements of that curious machine, for the excellent purpose of assisting vision.

IN proportion as these improvements were gradually invented, and applied to use, during a long series of years ; when each successive discovery was brought to the utmost extent of its perfection, mankind then observed that the human eye, in a very superior manner, enjoyed that particular advantage which they had sought after with so much art and industry, exhibiting to view a perfect achromatic instrument of vision, adapting itself with surprising facility to the different brightness of its objects, and to a vast variety of distances.

AT

AT the last, a defect was discovered in telescopes, arising from the spherical figure of the glasses; in consequence of which, the focus of those rays which fall near the limb of the glass, and of such as pass near to its center, do not coincide. This defect, after various fruitless attempts to obviate it, has for many years been given up by the most ingenious artists as irremediable*. But though men have, in this instance, found that there are bounds placed to their utmost skill and ingenuity, yet have they learned this useful truth, that there are no discoverable limits set to the powers of that admirable cause which formed the human eye; this error being there entirely corrected, in

* The most probable means discovered, of late years, for correcting these spherical errors, has been offered to the public by that excellent British artist, Mr. Ramsden, who conceives them capable of being in great measure removed in the eye-glasses of telescopes (where they are most sensibly felt) by such an adjustment of the instrument as that the image formed by the object-glass shall fall as near as possible to the eye-glass.—See *Philosophical Transactions of the Royal Society of London*, A. D. 1782.

the curious construction of the crystalline humour, the principle refracting lens of the organ of vision ; which, gradually encreasing in density from the limb toward the middle, does by this wonderful variation of its refractive power in one respect, counteract the errors which would have arisen from the other consideration.

THIS happy union of different parts and movements, as well in the natural, as in the artificial machine, each attaining its own particular end, and all together without confusion or interference, compleating one greater and more excellent effect,—this, I say, reasonable men denominate a work of design ; and as they affirm that the telescope is an instrument formed to assist vision, in consequence of various *means*, duly connected, by an invisible cause (for it is plain that there is some moving principle in man, which is neither eyes, ears, hands or head, neither the *tout ensemble* of all these, nor in any respect the object of our senses :) so do they believe that the human eye is an instrument made
for

for the use of man, by an exceeding apt combination of intermediate causes, wonderfully and most unaccountably connected together by one, great, wise, and good cause; who is neither the eye itself, nor any part of its mechanism, nor at all the object of our senses; but only visible to us through the beauty and wisdom of the works of creation, in the same manner as thought and intelligence in man are known to us through those motions and effects daily produced before us, which we do always suppose to result, originally, from a principle in some sort resembling our own minds.

FROM hence, and a thousand other similar analogies, for apprehending which our faculties are admirably suited, mankind have reasonably inferred the existence of *one, superior, intelligent, good* being; who is every where present; whom we see, and feel, and hear, every moment of our lives, in the visible works of nature, as we do in particular circumstances hear, and feel, and see, other beings whom we denominate men.

To

To this reasoning, which does not in any respect appear uncandid or delusive, the author of the treatise, *Sur la Nature*, warmly objects.—What! the eyes made for vision, which in many instances fail and become blind?—The teeth and jaws made to grind food, which so often loosen, and refuse to perform their office?—The earth formed to support its inhabitants, while it contains volcanos which may have destroyed them by fire? Or an ocean, which has overwhelmed them under its waters?

THESE are some of the objections of that extraordinary writer, and this the general mode of argument, unhappily adopted on the Continent by too many of those who have obtained the honourable title of philosophers: A false species of reasoning, in which the positive parts of human knowledge are most sophistically supplanted by what is purely negative—In which a man is required to judge of the truth of what he knows, by those other parts of nature where he is avowedly ignorant.

FROM

FROM principles such as these, the Christian Religion has been hastily rejected; because the population of America, and the accidental qualities of its inhabitants, could not immediately be explained by speculative men, who had no other data whereon to reason, except the imaginary extent of their own genius, together with an entire ignorance of the situation of that continent, and the qualities of its inhabitants*.

* The proximity of America to the continent of Asia is now perfectly ascertained by the British navigators.—The confident assertion of modern philosophers, that its inhabitants were beardless, is from many quarters proved to be false; and there is every reason for believing that their copper colour, and other peculiarities, are altogether the effect of soil and climate, since the progeny of the Europeans has been found to suffer very considerable changes in all these circumstances, even during the course of those few generations which have passed since their first establishment there. So that in these instances, revealed religion, so far from apprehending danger from the discovery of truth, and the improvement of human knowledge, has only suffered from the ignorance or misinformation of philosophers.

FROM

FROM the same deceitful source of reasoning, this beautiful world, so aptly formed, so wisely moved, so bountifully and yet so variously adapted to maintain its different inhabitants, that the native of every country from the Equator to the Poles, finds cause to bless his situation, and to boast of comforts unknown in other climates. This curious structure, the delight and wonder of the best and wisest men in every age, has been condemned by a few presumptuous sophists, as the work of blind destiny, acting through the present elements of nature, because there are many of its principles and movements of whose use they are ignorant ;—because there appear to be vestiges of the ravages of fire, or the inundations of the ocean, which they are not able to explain.

IT is most certain, that the laws of motion which now exist, could not have produced this world in the beginning, neither are they capable of continuing it for ever in its present state.

THE

THE interior structure of the earth, whereby its various fossil substances, though differing exceedingly from each other in specific gravity, though not arranged according to any regular law of situation, do yet constitute a world self-balanced, a sphere whose center of gravity coincides with its center of magnitude (without which all its motions must have been in an extreme degree irregular) evidently demands a first cause, which neither acts blindly, nor of necessity.—A blind principle is not wont to labour in defiance of all chance ; neither do mechanical causes usually produce their effects in contempt of the established laws of matter and motion.

THE gradual ascent of our continents from the shores of the ocean, toward their mediterranean parts, so necessary for collecting the rains of Heaven, and giving birth and course to those rivers which beautify and fertilize the earth. This exterior form, without which the vapours of the sea would have

have ascended to the clouds in vain, plainly requires the interference of some principle superior to any of the known elements of nature. Whatever the followers of Epicurus may think of these mighty elements, no reasonable man will ever believe that the waves of the ocean could have created a country whose soil lies far above the level of its waters ; or that the fury of volcanic eruptions have produced an effect, so general, that we are rather led to infer the casual existence of former volcanos, in particular places, because of some apparent interruption to this universal regularity of form.

THE projectile force by which the earth was in the beginning made to move round the center of light and heat ;—its diurnal rotation, duly diffusing this light and heat over its surface ;—the inclination of its axis to the plane of the ecliptic, whereby the tropical climates receive fewer of the sun's rays, while the inhabitant of the polar circle enjoys

enjoys a larger share* : All these effects, far surpassing the present powers of nature, most aptly combined together, working in concert without interference or disorder, for the attainment of *one, great, and good, and excellent* end, clearly prove that this world has been produced by *one, powerful, intelligent, and benevolent* principle, utterly unlike to any mechanical cause which does now exist, or that can be conceived to exist.

MECHANICAL causes, such as we are acquainted with, evidently tend to destroy the present form of the world; and thereby afford the strongest proof that it is not by its constitution immortal.

SIR Isaac Newton has demonstrated, that the perturbing forces which take place in the solar system, must in due time destroy the planetary motions, unless the first mover of all things shall chuse to interfere. And it

* Vide Keil's Phys. Essays.

is sufficiently evident, that the slow but certain operations of heat and cold, together with the continued action of the air and storms, are capable of breaking and changing the most firm bodies, even the hardest rocks ; while the numerous rivers on the earth's surface, and the waves which wash its shores, perpetually labour to bear all these substances into the bottom of the ocean, and thereby to reduce all things to a level situation.

SINCE then the earth yet continues to circulate with regularity round the sun, notwithstanding the perturbing forces of the planets—since all the countries on its surface still retain their elevated form, in opposition to those boasted mechanical causes, that labour incessantly to destroy it—since its impetuous rivers which pursue their course toward the ocean, have not yet smoothed those abrupt and precipitous cataracts, over which they rush with such unbridled fury, it is plain, either that the world, as we now see it,

it, is but of a short duration ; or else, that some saving hand has interfered, to retard the progress of causes which in sufficient length of time must needs produce their effects.

IF we cast our eyes over the annals of the world, we shall find in the history of the human race, a clear and decisive evidence in favour of those general truths which our religion teaches, concerning the duration of the earth and its inhabitants. The evident marks of novelty in all those arts and sciences that are the offspring of experience : The wonder and terror with which the earlier philosophers (though in other respects well informed men,) were wont to behold many of those natural appearances, which longer observation has shewn to be neither uncommon nor dangerous : The general defect of all histories and traditions antecedent to a certain period at which the Jewish writings affirm the world to have been destroyed by water : These cogent circumstances afford the plainest proof that

that the human race has not existed here for many ages.

THERE is not now a nation on the earth, neither has there been one for these two thousand years past, whose most remote traditions extend, with any degree of probability, beyond that memorable period of the universal deluge, which is recorded in the sacred writings; so that whatever Monf. Voltaire, and others, may assert concerning the eternity of the world, its motions, or its inhabitants, they will find but few rational men to adopt his wild system of astronomy, or who can be persuaded to believe that the sun ever rose in the west, or that the Babylonians made observations on that luminary some millions of years ago, when it was at the north pole*.

PERHAPS

* Monf. Voltaire, and after him the Abbe Reynall, believes that the earth has an unknown motion round one of its equatorial diameters, in such sort that its axis performs an entire revolution in the space of four
millions

PERHAPS you will say, that such language as this is silly and childish, beneath the name of philosophical, and unworthy of any answer—yet I can assure you it is the general language of that miserable school of modern philosophy, which searches for the most unknown motions in nature, to explain those that are best known;—which breaks fragments from the sun by chance, and then

millions of years. Voltaire's proofs of this motion are founded on an observation of the obliquity of the equator and ecliptic, said to have been made by Pythias about two thousand years ago; on the general accounts to be met with in Ovid's *Metamorphoses* of strange revolutions having formerly taken place on the earth's surface; and on a wild fable of the Egyptians, affirming that the sun rose twice in the west within the memory of their nation.—Nay, this extraordinary philosopher seems to imagine it not very improbable that the poles themselves may travel over different parts of the earth's surface; and it seems but a slight objection to this belief, that the oldest monuments in the world, the pyramids of Egypt, are accurately situated to face the cardinal points of the compass, the stability of which cardinal points entirely depends on the continuance of the poles of the earth in the same precise spot of the surface.

O

mysteriously

mysteriously forms them into habitable worlds ;
 —which makes the ocean to act where it is
 not * ;—which quotes the fables of Ovid, or
 the tales of the Egyptians, as its best autho-
 rity in natural history † ;—which utterly re-
 jects the delightful and profitable pursuit of
 final causes ‡ ;—and holds the most precious
 moments of life to be well employed in en-
 deavours to discover the thoughts and amuse-
 ments of trees and stones ||.

IF this be wisdom, we, my friend, have
 reason to boast that we are not wise : If
 these be the vaunted fruits of freedom of
 thought, we have good cause indeed to re-
 joice that we are not free ; that we still re-
 tain our dependance on a wise and boun-
 tiful Providence ; and have not yet fallen

* Vide Buffon Theorie de la Terre.

† Vide Voltaire's Period of 4,000,000 Years.

‡ Vide Des Cartes, Maupertius, &c.

|| Vide Robinet Sur la Nature.

into that universal anarchy of opinion, where each individual labours to enthrone and to adore every wild phantom of his own wandering imagination, just as folly or caprice may chance to direct his choice.

F I N I S.

